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**Calm or Storm?**  
**Wind Power Actors' Perceptions of**  
**Finnish Wind Power and its Future**

Vilja Varho

Academic Dissertation in Environmental Science and Policy

Department of Biological and Environmental Sciences  
University of Helsinki

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- Supervisor** Professor Ilmo Massa  
Department of Biological and Environmental Sciences and  
Department of Social Policy  
University of Helsinki  
Helsinki, Finland
- Reviewers** Docent, Dr. Ilkka Ruostetsaari  
Department of Political Science and International Relations  
University of Tampere  
Tampere, Finland
- Dr. Jarmo Vehmas  
Finland Futures Research Centre  
Tampere, Finland
- Opponent** Docent, Dr. Jyrki Luukkanen  
Finland Futures Research Centre  
Tampere, Finland

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# Abstract

## **Calm or Storm? – Wind Power Actors' Perceptions of Finnish Wind Power and its Future**

In international literature, wind power is considered an example of ecological modernisation. It is one of the renewable energy forms that has been developed and taken to use in order to reduce the environmental impact of energy production and to increase energy security. Wind turbine industry has become a significant field of industry in many places. Finland has turbine industry but wind electricity production has been slow in international comparison, and nationally set targets have not been met.

This study explores social factors that have affected the slow development of wind power in Finland. I have studied the perceptions of Finnish national level wind power actors. By that I refer to people who affect the development of wind power sector, such as Ministry officials, Members of Parliament, representatives of wind electricity production companies, wind turbine industry and various organisations, and wind power researchers. The material consisted of interviews, a questionnaire filled in by the interviewees, and written sources such as Parliament documents.

The results show that the perceptions about wind power, its future, and the methods to promote it were divided. There are definition struggles about wind power which is, for example, marginalised and defended. These struggles affect views of the significance and potential of wind power in Finland, and also affect investments in wind power and choices made in wind power policy.

Although there was much scepticism about wind electricity production, wind turbine industry was seen more uniformly as a credible industry. The turbine and component industry is a significant motive to promote wind power to many wind power actors as well as to the Finnish wind power policy as a whole. The domestic electricity production and the export turbine industry are combined in so-called home market argumentation.

Views of the future were clearly demonstrated in scenarios that were drafted based on the interviewees' perceptions. The views included scenarios of fast growth, but in the most pessimistic views, wind power was not thought to be competitive without support measures even in the year 2025, and the capacity of wind power was correspondingly low in these estimates. In such a scenario, the policy tool choices were expected to remain similar to ones in use at the time of the interviews. So far, the development in Finland has followed closely this pessimistic scenario.

Finnish wind power policy tools have included investment and tax subsidies, research and development funding, and information policies. Feed-in tariffs and green certificates that are common elsewhere have not been taken to use in Finland. Some interviewees considered such tools unsuitable for free electricity market and for the Finnish policy style, dictatorial, and being against western values. Other interviewees supported their use, particularly because of their effectiveness. The criteria used to evaluate policy measures were both process-oriented and value-based.

The policy tools used so far in Finland do not seem sufficiently effective to increase wind power production significantly. Marginalisation of wind power in discourses, small consumer demand for wind electricity, and the view that the low consumer demand represents the political views of citizens towards promoting wind power, make it more difficult to take stronger policy measures to use.

Wind power has not yet significantly contributed to the ecological modernisation of the energy sector in Finland, but the situation may change in the future as, for example, the need to reduce emissions from energy production continues.

# Tiivistelmä

## Tyyntä vai myrskyä? – Tuulivoimatoimijoiden näkemyksiä Suomen tuulivoimasta ja sen tulevaisuudesta

Tuulivoimaa pidetään kansainvälisessä kirjallisuudessa esimerkkinä ekologisesta modernisaatiosta. Se on yksi uusiutuvista energiamuodoista, joita on pyritty kehittämään ja ottamaan käyttöön mm. energiantuotannon ympäristöhaittojen vähentämiseksi ja omavaraisuuden lisäämiseksi. Tuulivoimateollisuudesta on tullut monin paikoin merkittävä teollisuudenhaara. Myös Suomessa on tuulivoimateollisuutta, mutta tuulivoiman rakentaminen on ollut kansainvälisesti vertaillen hidasta, eikä kansallisesti asetettuja tavoitteita ole saavutettu.

Tutkimuksessa on tarkasteltu yhteiskunnallisia tekijöitä, jotka ovat vaikuttaneet tuulivoiman hitaaseen kehitykseen Suomessa. Tutkimuksen kohteena olivat suomalaisten kansallisen tason tuulivoimatoimijoiden näkemykset. Tällaisia toimijoita ovat henkilöt, jotka vaikuttavat tuulivoimasektorin kehitykseen, kuten virkamiehet, kansanedustajat, sähköntuotantoyritysten, tuulivoimateollisuuden ja erilaisten järjestöjen edustajat sekä tuulivoima-alan tutkijat. Tutkimusaineisto koostui haastatteluista, haastateltavien täyttämästä kyselylomakkeesta sekä erilaisista kirjallisista lähteistä kuten valtiopäiväasiakirjoista.

Tulokset osoittivat näkemysten tuulivoimasta, sen tulevaisuudesta ja sen edistämiseen käytettävistä ohjauskeinoista jakaantuneen voimakkaasti. Tuulivoimasta on käyty määrittelykamppailuja, joissa sitä esim. marginalisoidaan ja toisaalta puolustetaan. Määrittelykamppailut vaikuttavat käsityksiin tuulivoiman merkityksellisyydestä ja mahdollisuuksista Suomessa ja sitä kautta tuulivoimainvestointeihin ja tuulivoimapolitiittisiin valintoihin.

Vaikka tuulisähkön suhtauduttiin usein epäilevästi, tuulivoimalateollisuus nähtiin selkeämmin uskottavana teollisuutena. Voimala- ja komponenttiteollisuus on monelle tuulivoimatoimijalle sekä kansalliselle tuulivoimapolitiikalle kokonaisuutena merkittävä motiivi edistää tuulivoimaa. Kotimainen sähköntuotanto ja vientiteollisuus yhdistyvät ns. kotimarkkina-argumentaatiossa.

Käsitykset tulevaisuudesta tulivat hyvin esille skenaarioissa, joita laadittiin haastateltujen näkemysten pohjalta. Haastateltavien näkemykset tuottivat myös voimakkaan kasvun skenaarioita, mutta pessimistisimmissä arvioissa tuulivoiman ei uskottu olevan Suomessa kannattavaa ilman tukia edes vuonna 2025, ja tuulivoimakapasiteetti olikin näissä arvioissa matala. Tällöin ohjauskeinovalintojen oletettiin pysyvän samankaltaisina kuin haastatteluajankohtana. Tähänastinen kehitys on Suomessa pitkälti seurannut tätä pessimististä skenaariota.

Tuulivoiman edistämiseen on Suomessa käytetty investointi- ja verotukea, tutkimusrahoitusta sekä informaatio-ohjausta. Muualla maailmassa tyypillisiä edistämiskeinoja, kuten syöttötariffeja ja vihreitä sertifikaatteja, ei ole otettu Suomessa käyttöön. Osa haastatelluista piti sellaisia keinoja soveltumattomina avoimille sähkömarkkinoille ja suomalaisen ohjauspolitiikkaan, diktatorisina ja länsimaisten arvojen vastaisina. Toiset taas kannattivat niitä erityisesti niiden vaikuttavuuden takia. Ohjauskeinojen arvioinnissa käytettiin sekä ohjausprosessiin liittyviä että arvoperustaisia kriteerejä.

Tähän asti käytetyt ohjauskeinot eivät tunnu riittävän vaikuttavilta lisäämään tuulivoimaa merkittävästi. Voimakkaampien ohjauskeinojen käyttöönottoa kuitenkin vaikeuttavat tuulivoiman marginalisointi diskursseissa, vähäinen kuluttajakysyntä ja oletus siitä, että vähäinen kulutuskysyntä vastaa myös kansalaisten poliittista suhtautumista tuulivoiman lisäämiseen.

Tuulivoima ei vielä ole merkittävästi edistänyt energiasektorin ekologista modernisaatiota Suomessa, mutta tulevaisuudessa tilanne voi muuttua mm. energiantuotannon päästöjen jatkuvan vähentämistarpeen takia.

## Preface and acknowledgements

This research represents social scientific energy research. My background, however, is in the environmental protection science. The motivation for this study sprang not only from a wish to study and understand, but also from a desire to participate in and contribute to the improvement of the state of the environment. In my opinion, even with its negative impacts, wind power is an environmentally preferable form of energy production in general. This does not mean that any means of promoting it or any particular project would be economically, politically, socially, culturally, or environmentally feasible or sensible. In order to gain information about current issues relating to wind power, I joined the Finnish Wind Power Association. While I wish to make my preference for wind power known to the reader, I assure that I have not conducted my research from any other predetermined point of view. Instead, I have tried to approach the topic with an open mind and as objective manner as possible.

I first began to study wind power after I was offered the opportunity to work in a research project “Ecological modernisation of Finnish energy sector” lead by Ilmo Massa. I chose wind power as my topic, because I considered it to be a very potential but as yet underdeveloped sector in Finland. I wish to extend my thanks to my supervisor Ilmo, for trusting me with the position in his research group, and for the many discussions we had, and advice and comments that he gave me over the years.

I am also grateful to the organisations that funded my research: the Academy of Finland, Maj and Tor Nessling Foundation, and the University of Helsinki.

Perhaps most of all, thanks are due to the interviewees, in Finland and abroad, who generously gave their valuable time and expertise to my use. Many of them also provided me with very useful documents. Without the interviewees, none of this would have been possible.

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## Original articles

**I** Varho, V. and Tapio, P. (2005) Wind power in Finland up to the year 2025 – ‘soft’ scenarios based on expert views, *Energy Policy* 33(15): 1930-1947.

**II** Varho, V. (2006) Wind power policy options in Finland - Analysis of energy policy actors’ views, *European Environment* 16(4): 198-212.

**III** Salmela, S. and Varho, V. (2006) Consumers in the green electricity market in Finland, *Energy Policy* 34(18): 3669-3683.

### Authors’ contribution to the publications

**I** Varho designed the study, collected the material, analysed the qualitative material and wrote the article, except the methodological description of the cluster analysis (Section 3.5) which was written by Tapio. Tapio conducted the computer runs of the cluster analysis of the quantitative material, but the decisions regarding clustering were made together.

**II** Varho designed and conducted the study and wrote the article.

**III** Salmela and Varho had equal responsibility and provided equal contributions to the article. Each designed, collected, and analysed separate empirical materials. Further theoretical development, and the design and writing of the article were done jointly with equal contributions from both authors. Varho had a slightly larger role in writing the Section 3 regarding energy sector actors’ views, and Salmela in writing the Section 4 regarding barriers identified by consumers.



# 1 Introduction

## 1.1 Background and outline of the study

Growing global concern over climate change has increased the attention given to renewable energy sources. International agreements – particularly the United Nations Framework Convention on Climate Change (United Nations 1992) and the so-called Kyoto Protocol (United Nations 1998) – have given tangible form to this concern and a mandate to national and regional policies that promote climate-friendly energy solutions.

Environmental policy is also undergoing large-scale changes, in which deregulation, market-based tools, and multilateral participatory processes are emphasised. These changes are often thought to represent governance that has progressed in Europe since the 1970s (Pierre and Peters 2000; Jordan *et al.* 2005).

The European Union has several policies related to climate change, most notably the so-called carbon emission trade (see EU Directive 2003/87/EC). The EU also has concrete targets for the shares of renewable energy forms (e.g., EU Directive 2001/77/EC). The promotion of renewable energy forms is not only based on environmental concerns, however. Instead, decreasing dependence on imported energy and growth of new industrial sectors are objectives of the renewable energy policy (European Commission 2000; 2006). These objectives correspond with the theory of ecological modernisation, which argues that ecologically sound practices can be compatible with a sound economy.

Recently, one of the fastest-growing energy forms in Europe has been wind power. The wind power capacity in the European Union (EU-25) was 40,502 megawatts (MW) in the end of the year 2005, with certain countries having thousands of megawatts of installed capacity (EWEA 2006). Wind power industries have become significant businesses and employers (European Commission 2004).

Despite the international trend, various domestic wind power policies, and the Finnish wind turbine industry, wind electricity production has progressed slowly in Finland. By the end of the year 2005, only some 82 megawatts (MW) of wind power capacity had been installed in Finland, producing about 0.2% of the electricity consumed in Finland (Holtinen 2006). Finland has not been able to meet the nationally set targets for wind power capacity.

In 2001, I began to question whether wind power might play a part in the ecological modernisation of the Finnish energy sector. My original idea was to discover why wind power has made such slow progress in Finland. As I studied the issue more, I realised that I could not answer the question with the knowledge available. Various actors seemed to have conflicting explanations. Then I realised that the contradictory views and arguments of the Finnish wind power actors were a fascinating topic of research on their

own. By wind power actors I refer to individuals that influence wind power development. This group includes, for example, actors that formulate wind power policy in government bodies, actors that make concrete decisions to invest in wind power, and actors who participate in public discussion about wind power. While there certainly were technological and economic constraints to wind power expansion, it began to look as if social factors also contributed, in the form of social constructions regarding wind power and wind power policy. The wind power actors' views and constructions could give a partial answer to my original question, since the perceptions, definitions, and arguments of the actors are part of the societal circumstances that determine the success of wind power.

Accordingly, in this study I explore the ways in which Finnish wind power actors perceive and socially construct images of wind power, its future, and the methods that can be used to promote it in Finland. Documents such as governmental renewable energy programmes are not very transparent; they do not reflect the wide variety of views that can be found among those who participate in drafting these documents. Instead they only show the end result of co-operation and compromise. In addition, the working groups for such programmes have not included people who work in wind power companies. I have therefore collected material through empirical methods of the views of actors who influence the wind power sector development, and I have studied these views from different viewpoints. The actors' perceptions and constructs have contributed to the formulation of the Finnish wind power policy and have affected the development of the sector in general. The actors' perceptions alone do not determine policy or investment decisions, but understanding their views also makes the decisions more understandable.

The rich material used in this work is intended to analyse and clarify Finnish views on wind power, its future and potential, and various wind energy policy instruments. It is hoped and believed that the results will contribute to research on energy and the environment, to understanding policy choices, and to the ecological modernisation of the Finnish energy sector to a more environmentally sustainable direction.

In this first chapter, I will outline the study and discuss previous research in this field. Up to now, there has been little social scientific wind power research, particularly in Finland. At the end of the chapter I will present the research question and the focus of the research.

The theoretical framework of this study is described in Chapter 2. It is partly based on ecological modernisation theory, in which wind power has been given high status as a way of directing energy production in a more environmentally sustainable direction. Another important element is the role of actors' perceptions in influencing the development of the wind power sector.

I will also discuss certain methodological choices in Chapter 2. For example, during the preliminary phase of the study, I realised that there was some disagreement about wind power's potential in Finland, and accordingly, about investment prospects as well as suitable targets for wind power policy.

As only some 40 MW of wind power had been installed in Finland at the time, it seemed that views of the future were particularly important for wind power development. To explore these various views, I introduced concepts and methods from futures studies.

The materials and methods are described briefly and discussed in Chapter 3. In addition, four appendices provide details about the material collected.

Wind power is an international field and market, and it is important to present an overview of the development of the wind sector globally and to portray the international context for Finnish wind power. This will be done in Chapter 4, based on the literature in the field. The success of wind power in certain countries has inspired Finnish actors in this field, and it would be difficult to understand their views without knowing something about the history and development of global wind power. The overview of the global wind power context also provides us with an opportunity to learn from the experiences of other countries.

The Finnish wind power sector is described in Chapter 5. This description includes observations about the growth of the sector, Finnish policies, and the relevant actors. It helps to explain the choice of interviewees and explains the context in which they operate. The chapter also contains results of an analysis of Parliamentary documents pertinent to wind power policy.

Results of the analysis of material gathered from Finnish actors through interviews and a questionnaire are presented in Articles I-III and in Chapter 6. The results are discussed further in Chapter 7, and conclusions are presented in Chapter 8.

## 1.2 Previous research

### 1.2.1 Wind power research

Immense research efforts around the world are put into wind power technology, and Finland is no different. In addition, the impact of wind power production for the Finnish electricity system has been studied extensively by Holttinen (2004), for example.

The environmental impact of wind power has also received considerable attention. The main environmental benefit is often considered wind power's ability to reduce carbon dioxide emissions by offsetting production from other energy forms. Turkulainen (2000) has calculated the life-cycle emissions of wind turbines and concluded that in 3 to 4 months of operation, a wind turbine produces enough energy to compensate for the energy that went into its production. Holttinen *et al.* (2002) calculated that in the then-current situation of the Nordic electricity market, each kilowatt-hour (kWh) of wind electricity reduced the carbon dioxide (CO<sub>2</sub>) emissions by about 700 grams.

Renewable energy forms can also reduce other kinds of air pollution, such as particles and acidifying emissions (Tuhkanen and Pipatti 1999).

However, like all energy production forms, wind power also causes negative environmental impacts. According to some authors, the main negative environmental impact of wind power is to the scenery (e.g., Gipe 1991). This impact has been studied through different methods. For example, the economic value of the visual impact of wind turbines has been evaluated by Hanley and Nevin (1999) and Álvarez-Farizo and Hanley (2002).

The studies of wind power's impact on wildlife have concentrated on birds, as there has been concern over birds hitting the turbines. According to the review by Koistinen (2003), wind power plants cause minimal risk compared to other structures in Finland, such as electricity lines, tall buildings, and link masts. However, some bird species are known to be at considerably more risk than others. These are predators such as eagles and hawks that hunt during the day. They attempt to perch on the turbines or sometimes fail to see the turbine as they dive for prey (Walsh 1997). Migratory birds are also at risk. Finding suitable sites is crucial in limiting damage to birds. Recently, attention has focused on offshore parks. Such parks have been studied in Denmark, and significant impact to waterfowl has not been observed (e.g., Guillemette *et al.* 1998; 1999; Desholm and Kahlert 2005).

There are also studies of the impact of offshore plants on clams, fish, and seals, for example (see <http://www.hornsrev.dk/Engelsk/Miljoeforhold/uk-rapporter.htm>). There is little indication that wind parks would cause long-term problems for marine species.

Societal issues relating to wind power have been studied to a much lesser degree. The social scientific research regarding wind power is often about local issues, such as siting and planning outcomes. One of the important results has been the great importance of local involvement and/or local ownership of turbines for the successful realisation of a wind power project (e.g., Toke 2002; 2005).

Another possible social scientific approach to wind power is through policy analysis. It is not a single method or theory, but rather a group of approaches that have as a common goal describing, explaining, commenting on, or critiquing the political decision-making process (Ruostetsaari 1998: 6). According to a definition by Dye (1992: 5-6), policy analysis can be the description of policy, the research of the causes for political decisions or programmes, or research on the impact or consequences of such decisions and programmes.

Policy analyses have been carried out on the impact of wind power policies, largely with regard to their effectiveness. For example, Hemmelskamp (1999) and Klaassen *et al.* (2005) have considered the impact of policies on wind power innovation, arriving at somewhat conflicting results, as will be discussed below (Section 6.3.1). The feasibility of various policies has also been studied, numerous articles having been written about green certificate trading, for example (Morthorst 2001; 2003). However, there

is less research on policy determination, that is, *why* wind power policy is the way it is. There are exceptions, of course, that include Michaelowa (2005), who discussed the influence of the German wind turbine lobby in policy making.

Although in this study I do not give a conclusive explanation for Finnish policy choices, a better understanding of the views and perceptions of those who influence wind power policy also helps in understanding the policy-making process.

### 1.2.2 Finnish social scientific energy research

This study is a new link in the history of Finnish social scientific energy research. The following description of such research is obviously not exhaustive, and it concentrates on energy markets and energy policy.

The tradition of Finnish social scientific energy research can be said to have started in the 1970s, although studies of the history of energy production and energy economy were made already from the 1940s onwards. The first, more thorough overview of energy issues with cultural, social, and ecological perspectives was a collection of articles entitled *Energia, kulttuuri ja tulevaisuus* (Massa 1982). From then on, numerous studies from different disciplines emerged relating to attitudes, consumer behaviour, energy futures, etc. (Sairinen 1991.)

Research on national energy policy and energy policy making began mainly in the latter half of the 1980s, particularly in studies regarding energy political elites (Karjalainen 1986; 1987; Ruostetsaari 1987; 1988; 1989). Values and value conflicts in general energy debate were analysed by Malaska *et al.* (1989).

Early energy studies were often very broad. Since the beginning of the 1990s, the research has diversified, and it has often been concentrated on smaller aspects or sub-sectors. For example, studies were made concerning the liberalisation and deregulation of electricity markets (e.g., Ruostetsaari 1998; Sairinen *et al.* 1999: 123-145; Vehmas 2000).

Nuclear power has dominated the Finnish energy policy debate for decades, and consequently there are many studies of nuclear power. A recent collection of articles (Kojo 2004) reflects the tradition of Finnish social scientific research which is often critical of nuclear power and of the various phenomena around it.

Consumer research has continued, but also studies have emerged in which people are distinctly seen as citizens rather than as consumers (e.g., Paldanius 1992). The line between a “consumer” and a “citizen” has somewhat blurred in the studies of everyday environmental politics. In such a tradition, daily choices such as consumer choices made in order to influence production structures have been considered political actions. Everyday environmental politics have been called “small”, as compared to the “large”

societal environmental politics (Massa and Haverinen 2001; Massa and Ahonen 2006: 13).

In recent years, a number of studies has been carried out using actor network theory, by Palmroth (2004) and Åkerman (2006), for example. Palmroth (2004) discussed two wind power projects – Lumituuli in Finland, and Mittelgrunden in Denmark – in which individual citizens as a collective were able to invest in and start wind electricity production into the electricity grid, and thereby actively take part in the ecologisation of the electricity sector. Her thesis is one of the few social scientific wind power studies that has been conducted in Finland thus far.

The 1990s and the beginning of the 21<sup>st</sup> century have seen a merging of energy and environmental issues in policy making, most obviously in the case of climate change policy. Climate change policy has been studied in Finland by Järvelä and Wilenius (1996) and Wilenius (1997), for example. Tirkkonen (2000) described the formation of climate change discourses and Finnish climate policy. Vehmas (2002) discussed political “story lines” of energy tax reform in 1993–1996. These studies have looked at policy through actors’ views and discourses. This is the tradition to which the present study belongs.

Such a focus on perceptions, arguments, and social constructions of issues may be a way to counter the “factual” and “objective” energy research that is often carried out in technological, natural scientific, and economic fields. I do not claim that any one of these approaches or fields is superior to others, but rather that they complement one another. My wish to concentrate on subjective perceptions is partly inspired by the previously mentioned studies that emphasise them and partly is a result of my own previous energy research.

I first studied energy issues in 1995–1996 in a course project on Finland’s energy futures (Nurminen *et al.* 1996). In that study we asked a number of Finnish energy sector actors to envision the shares of different energy forms in Finnish energy consumption up to the year 2030. As I later studied the impacts of photovoltaic electrification (Varho 2000; 2002), I discovered the complexity of evaluating just the environmental impacts of an energy source, not to mention the social and economic impacts. I also realised that decision-makers are confronted with sharply conflicting views about the costs, benefits, and feasibility of any renewable energy form or project.

### **1.3 Research objectives and the research question**

Wind power has been identified as one way to promote the environmental sustainability of the energy sector and a factor contributing to ecological modernisation. Yet its progress in Finland has been slow. The first objective of this research is to increase understanding of societal factors that have affected wind power development in Finland. The wind power actors’ views of suitable courses of action are clearly one of the factors affecting policy choices



and investment decisions and thereby the development of the wind power sector. Another objective is to map the variety of views and analyse the social constructions regarding Finnish wind power in order to contribute to research on energy, the environment, ecological modernisation, and social construction processes.

The research interest is hermeneutic, a wish to explore views and phenomena, to understand them, and to make them understandable to others. One objective is to produce results that can be used when Finnish wind power and measures to promote it are evaluated and developed, particularly in order to become increasingly effective in lessening the environmental impact of the energy production sector. A multifaceted and multidisciplinary approach is used in the hope of giving depth to the analysis and to make the results interesting and useful also in other contexts.

The research question is this:

*How do Finnish wind power actors perceive and discuss Finnish wind power, its future, and the means of promoting it in the electricity market?*

The answer is sought in arguments and views of wind power as expressed in interviews, a questionnaire, and various documents. The research question has been approached in three articles, each with its own specific research question.

In Article I, wind power actors' images of the future of Finnish wind power were examined. These images were compared with the official view, as expressed in government programmes for wind power (MTI 1999a; 2003).

In Article II, I examined views of specific wind power policy instruments. I asked which instruments were favoured and what criteria were used to consider the merits of policy instruments in Finland.

In Article III, I examined how consumers are expected to behave in the green electricity market, how energy sector actors interpret consumer behaviour, and what conclusions they draw from it. These results were combined in the article with M.Sc. Suvi Salmela's results of consumers' own views regarding green electricity purchases.

In the present thesis, I will summarise the results of the journal articles (referred to by numbers I-III), and present an analysis of the way in which wind power is constructed in the discourses of the wind power actors. In that presentation I will focus on the way the image of wind power consists of a combination of wind electricity production and the wind turbine industry in Finland. These results complement the view of wind power that emerges from Article I.

### 1.3.1 Research focus

My results alone cannot describe all the views regarding all the issues relevant to wind power. To maintain a reasonably focused approach, I have had to leave certain interesting topics out of the research design.

First, I decided to exclude household-size turbines. The household turbines have little importance to the energy production sector and its ecologisation as a whole, even though they can be used to bring electricity to remote islands, etc. Few wind power plants that have enough power to heat a house, for example, have been erected in Finland (Kaarakainen 2006). However, it is possible that in the future there will be more small-scale wind turbines. Such a change to more locally-produced electricity and grass-roots level activism would merit more research in the future.

Second, it seemed sensible to concentrate on national issues, as Finnish wind power is still very much in national hands, although international organisations and obligations influence development, as will be discussed later. Also, when looking more than twenty years into the future (temporal dimension), it would have been impractical to stretch the study to focus on both national and local issues (spatial dimension).

Third, when discussing wind power policy measures, I have concentrated on market-related instruments. These include subsidies and information policies as well as feed-in tariffs and other policies that have been important in promoting wind power in other countries but are not (yet) in use in Finland.

This focus has meant giving less attention to planning and siting, which may also have significant impact on wind power development. Siting issues have been discussed in conjunction with scenarios about the future of wind power in Finland (I; Section 6.2) as well as with the analysis regarding discourses about environmental issues (Section 6.1), but I have mainly concentrated on economic and other market-related policies. This has been partly because of the focus on national policies, since planning is largely a local issue. Planning is also something that has to be taken care of regardless of other policies, so it is not in conflict with any other policy instrument. Limited research resources were also a contributing factor to the decision.

The impact these choices had on the results is mainly that there are fewer topics being discussed, not that the results are different from what they would otherwise be. That is, the choice does not affect the validity but only the breadth of the results. As siting disagreements seem to be increasing in Finland, I believe that the local issues would merit more study in the future. A more systematic approach to planning and siting questions could have produced interesting results.

I will mainly discuss measures that are aimed directly at supporting wind power development. This means that policies such as the carbon emission trading – which benefit wind power indirectly (Hadley and Short 2001; Honkatukia *et al.* 2003) – receive less attention. Some interviewees found this distinction rather difficult, as they were used to considering

together all policy measures that advance the use of renewable energy sources. Since I wanted also to study other aspects of wind power than wind power policy, the distinction was necessary. This narrow definition helped to focus the analysis and the discussion.

In addition, the crucial issue was not the inclusion of all possible wind power policy alternatives, but the analysis of the criteria by which policy options are valued and judged. Wind power can be promoted through many alternative measures, which raise some controversy, regardless of the use of other energy policy instruments. Carbon emission trading, for example, was seen to be existing reality, and the specific national wind power policies are additional measures, alternatives to one another but not to carbon trading. Therefore, the controversy regarding national wind power policy instruments is perhaps more interesting and the results more directly applicable to Finnish policy making. This was important to me, because I wished to do research that was policy-relevant.

Finally, during the analysis I had to select topics to be discussed and results to be presented. The construction of scenarios was planned even before the material was collected, but the other topics, and the way they were discussed, were not decided beforehand. It was during the analysis of the material that several interesting topics began to emerge. Since I already had a number of ideas and theories about the subject, the study is not “grounded theory”, as described by Glaser and Strauss (1967). For example, theories about policy choice were used in the design of the questionnaire and interviews (e.g., Jänicke 1997; Linder and Peters 1989). Nevertheless, I allowed the material to guide me and did not limit the analysis to any pre-set questions. This approach has been called “theory bound analysis” by Tuomi and Sarajärvi (2002: 98-99). It enabled the emergence of some new and sometimes surprising issues. For example, it was not until I began the analysis that I realised how complex a construction the image of wind power in Finland is (see Section 6.1).

Although I originally intended to study the roles of different actors who influence the wind power sector and the power relationships among them, I had largely to exclude these themes from the analysis. The power relationships were discussed in interviews and the questionnaire, but the results were not conclusive, except in the case of the views of the responsibility of consumers to promote wind power (see **III**; Section 6.3).

## 2 Theoretical and methodological framework

### 2.1 Ecological modernisation

Ecological modernisation has been one of the most central environmental discourses since the 1990s. The concept was created in the 1980s, largely as a reaction to “doomsday-prophesies”, the very pessimistic predictions and views of the 1970s. Ecological modernisation can be seen both as a political strategy and a theory of societal development (e.g., Mol 2003: 56-62).

Ecological modernisation has many definitions. It has been defined, for example, as a social development in which the interests of environment and economy are compatible (Massa 1995; Andersen and Massa 2000). One of the main themes of ecological modernisation has been the idea that ecologically sound and effective practices can also make good business sense. Dryzek (1997: 142), for example, lists five ways through which businesses can benefit from environmental protection: less pollution means more efficient production; preventing pollution is cheaper than cleaning up afterwards; a healthy and aesthetically pleasing environment means healthier and more productive workers; “green” goods and services can be sold to environmentally-conscious consumers; and pollution prevention and abatement products have a market of their own. In fact, ecological modernisation suggests a positive-sum solution (win-win) for economy and the environment rather than a zero-sum problem (Sairinen 2000: 78).

The ecological modernisation theory argues that, although production and consumption patterns have to be reformed in order to protect the environment, industrial or capitalist systems need not be abandoned (e.g., Mol and Spaargaren 2000). Nevertheless, ecological modernisation means social changes. Although Dryzek (1997: 142) notes that in ecological modernisation the industry co-operates in the design and implementation of policy, the change does not take place without other actors’ involvement. In fact, ecological modernisation is often seen to emphasise the growing importance of state interventions (Massa 1995). This may be because conventional businesses are established and secure, and changing the path of development to a new direction often requires societal intervention.

Path dependence is a general term that refers to institutions being self-reinforcing. In technology, the commonly-used related term is lock-in: we are locked into a certain technology (or type of technology), which often breeds new technology around it. The further we travel along a path, the more difficult it is to change the path, along with all the technological systems that have been created around it (e.g., Nakićenović *et al.* 1998: 45). An example is formed by the large central electricity production plants, high-voltage transmission lines, and lower-voltage grids that the electricity system in industrialised countries is based upon. Even new, smaller-scale technologies like wind power have to adapt to this system and supply electricity that is suitable for the grid or find niches where the electricity grids do not extend, such as remote islands or summer cottages. The search

for “soft” energy paths has been called for for many decades, for example, by Lovins (1979). The process has been slow, however, partly because it is not only technologies that are “locked in” but also education, research and professional patterns, social norms as well as legal and governmental institutions, with many actors having vested interests in the existing system, all of which Unruh (2000) has called Techno-Institutional Complex.

Huber (2000; 2004) emphasises that the reconciliation of environmental and economic factors that is central to ecological modernisation requires structural changes in the economy, not merely increasing efficiency and other improvements to existing structures. This means, for example, a transition to renewable energy sources. Huber (2004) stresses the importance of technological development in the ecological modernisation process and values wind power and other renewable energy sources that can decarbonise energy production.

Wind power can be seen as a prime example of ecological modernisation. It utilises a renewable energy source, its environmental impact is limited, and its development has created new technological know-how that has also become profitable. The aforementioned state interventions, in the form of subsidies and other policy instruments, have been necessary for the development of the sector, as will be discussed in Chapter 4. Toke and Strachan (2006) have noted, however, that building wind turbines in the UK has meant that wind power has become an environmental problem in itself, particularly in terms of landscape protection. Nevertheless, they see the progress of wind power in the UK as an example of ecological modernisation, although with some reservations.

## **2.2 Actors and their views**

As noted above, ecological modernisation is believed to require active policy measures. Environmental policy choices are influenced by local cultural and ecological circumstances (Paloniemi and Varho 2006). Some political scientists such as Linder and Peters (1989) emphasise the importance of the policy makers’ personal opinions and views of policy instruments in policy choices, rather than some objective characteristics of the instruments themselves. These aspects are not necessarily visible in policy documents, however. Policy statements, action plans, and other political programmes tend to be condensed and non-transparent. Although modern planning and policy making in Finland bring together many types of actors, the various views, perceptions, and arguments that exist behind the policies are not always apparent.

Also, ecological modernisation requires the efforts of many types of actors in addition to the policy makers, such as economic corporations or researchers. Their perceptions and views affect, for example, investment decisions, allocations of companies’ research and development funds, or

choices of new research topics. In this way, various actors have a large role in directing the development of the wind power sector.

Multiple actors also influence the policy measures that are used to support the wind power sector. This does not mean that all actors are active in politics or, in particular, that they see themselves as participating in policy making. For example, one interviewee in this study explained that he does not participate in politics, but he does participate in public debate. This distinction shows a narrow view of politics: It is seen as the activity of political bodies, such as Parliament and political parties, but public discussion and participation in it are non-political activities. Similar definitions of politics have been expressed by political scientists, for example, by Jansson (1985: 36-37). Lappalainen (1997: 89-91), however, describes political action as the act of defining some issue as a problem and suggesting solutions to it. In this way different individuals and organisations that offer their views about the best wind power policy are all participating in politics. I have shared this view in my study.

Luhmann (1989) and Hannigan (1995), for example, have demonstrated how environmental changes have to be constructed socially before they can become societal questions and society can react to them. In addition, *solutions* to environmental problems are also constructed, and not only constructed *as* solutions, but in other senses, too. Therefore “wind power” is also given many meanings in societal interaction.

Wind power means different things to different people at different locations and at different times. A social construct is formed in a particular location and time, and the same “real”, material elements or circumstances can be interpreted differently in different contexts. Any context also includes the previously existing social constructs.

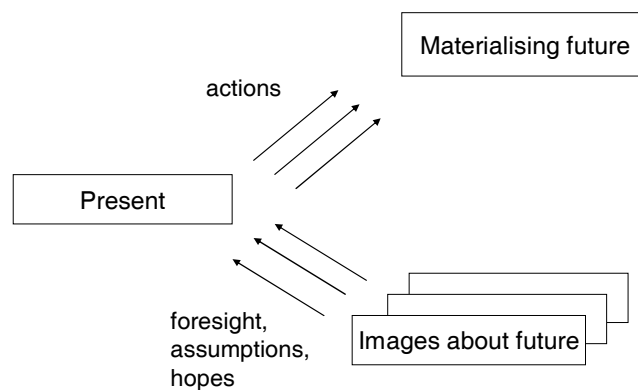
In this study, attention is more on the claims themselves (arguments, perceptions) than on the claims-makers or claims-making process (cf. Spector and Kitsuse 1977), but it is understood that Finnish – and international – conditions, actors, history, etc. influence the ways wind power and wind power policy choices are perceived in Finland. The international context is briefly discussed in Chapter 4, the national context in Chapter 5.

The social constructs regarding the concept “wind power” are studied through a discourse analysis of the interviews. The terms “discourse” and “discourse analysis” are flexible and imprecise (Hajer 1995: 43-44). Modifying Hajer’s (1995, 44) definition, I define a discourse as an ensemble of ideas, concepts, and arguments through which meaning is given to physical and social realities.

Jokinen *et al.* (2004: 17) think it might be more appropriate to call discourse analysis a theoretical framework rather than a method, as it allows various applications of focus or methods. On a general level, Jokinen *et al.* (2004: 11) distinguish between two directions in which discourse analysis can go: either to map the variability of discourses or to consider the struggles between discourses, concentrating on power relations. In this study I have concentrated on identifying the variability and the existence of struggles; I

have not been able to consider which discourses are more powerful than others. The particular way discourse analysis was used in this study will be discussed further in Chapter 3.

Although the future (by definition) does not exist yet, Hukkinen (2003) notes that the future can also be seen to exist as a construct of decision-makers and the experts who support them. The future is discussed, envisioned, planned for, etc. As decisions are made on the basis of assumptions about future development, the future is “present” now through the actions of the decision-makers. Actors’ perceptions and discourses influence choices and thereby the future.



**Figure 1.** Images of the future affect the choices made in the present, and therefore have an impact on what the future will be when it materialises, that is, becomes “present”.

The future is not set, it is made. The actors interviewed in this study are active makers of the future of Finnish wind power. Actions are directed towards reaching a desirable future. On the other hand, they are taken partly on the basis of foresight about future, and therefore our perceptions of possible, probable, and desirable futures are reflected on our actions, as illustrated in Figure 1. Actors’ perceptions are part of the societal circumstances that influence the success of wind power. To explore the views regarding wind power’s future, I used concepts and methods from futures studies.

### **2.3 Futures studies**

Futures studies can be used in numerous ways. For example, it is possible to estimate future developments in order to consider the impacts of actions taken today, or to find trends, weak signals, and other indications about

what the future may be like (Kamppinen *et al.* 2002). The Delphi-method is an example of a method that explores expert views (e.g., Kuusi 1999; 2003). This anticipation of the future may be what futures studies most commonly are thought to be. Futures research is much more versatile, however. Within its field, methods have been developed for envisioning a desired state and designing paths that need to be followed to reach it, such as soft systems methodology and various workshop styles (cf. Vapaavuori and von Bruun 2003). On a general level, Kamppinen *et al.* (2002: 25) define the central task of futures research to be the mapping of different possible worlds and the conditions (i.e., decisions, actions, and restrictions) through which those worlds can be reached. Bell (1997: 81-82) mentions the study of the content, causes, and consequences of images of the future as one of the tasks for futures studies. It is also common to have an emancipatory interest, i.e., to try to encourage and help people envision different future options and the paths that could lead to such futures (Kamppinen *et al.* 2002: 30; Söderlund and Kuusi 2002: 253-259).

In this study, the purpose of using futures research methods is to study the views and expectations of Finnish wind power actors in connection with the future of Finnish wind power as well as the actors' perceptions and arguments regarding factors that affect wind power development. These issues have been explored and made visible through the use of scenarios.

The idea is that just as studying history can help us to understand the present<sup>1</sup>, so can the study of future possibilities (Niiniluoto 1984: 71; Söderlund and Kuusi 2002: 259). The intention is therefore to study *present* perceptions through the use of futures research methods.

The views discussed above explain why I have used interviews in my study: interviews are a rational way of finding out what people think about wind power, its future, and the different instruments that can be used to promote wind power. According to Hukkinen (2003), the purpose of semi-structured interviews in futures studies is to explore the arguments, both factual and value-based, that decision-makers and experts use to justify their decisions. In this study, the interviews were complemented by using a questionnaire that (most of) the interviewees filled in before the interview (see Section 3.2). Together with Dr. Petri Tapio I developed a new method for scenario construction – called “soft” scenarios – in which a combination of interviews and a questionnaire was used.

### 2.4 Triangulation

The methodology of this study is based on *triangulation*, that is, the use of several different materials, methods, and theories in the same study (Eskola and Suoranta 1999: 69). Four types of triangulation are commonly distinguished in the literature: data triangulation (different data sets),

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<sup>1</sup> The historical development of wind power is discussed in Chapters 4 and 5.



investigator triangulation (different researchers), theory triangulation (different perspectives on the same data set), and methodological triangulation (different methods) (Denzin 1970: 301-310; Yin 1994: 90-94; Eskola and Suoranta 1999: 69-70). All types can be found within this research, although investigator triangulation is represented only by working with co-authors (I; III), and the analysis of the interviews of wind power actors was done by me alone.

The multiple types of research materials, or data sets, consist of interviews, a questionnaire, and written documents. The use of both a questionnaire and interviews made it possible to be more specific. For example, two interviewees might both say that there will be “much” new wind power capacity in Finland by 2010, but one could mean 500 MW and the other ten times as much. Using the questionnaire, it was possible to observe these kinds of differences. It was also possible to correct or modify questionnaire answers during the interviews.

Theory and methodological triangulation emerge as traditions, concepts, and methods from various fields such as environmental sociology, futures research, policy analysis, and discourse analysis that were combined into a multidisciplinary approach.

Multidisciplinary and triangulation made the work more challenging, but they also made the results more multifaceted. The social construction of wind power and views of the future of wind power and methods to promote it are such different issues that they cannot all be analysed using the same methods or theories. Denzin and Lincoln (1994: 2) note that in qualitative research the use of multiple methods reflects “an attempt to secure an in-depth understanding of the phenomenon in question” rather than an attempt to capture objective reality. I endeavoured to present a relatively broad approach to views about wind power, and triangulation made it possible to construct a deeper and broader image, first, by giving information about a wider range of issues and second, by giving multiple views of the same issues. However, the image revealed was not complete. For example, views of the technological factors influencing the future of wind power were given less attention than social factors. The study draws mainly from social sciences, but reflects the multidisciplinary and problem-oriented approach, which has been the tradition in the programme of Environmental Science and Policy in the University of Helsinki (e.g., Willamo 2005).

Some concepts and methodological issues may be difficult to reconcile in multidisciplinary studies. There are limits to triangulation, as a researcher cannot mix paradigms (Denzin and Lincoln 1994: 2). This is particularly apparent in studies that combine natural scientific and social scientific fields, because they often operate from different ontological and epistemological perspectives. My approach was based on *contextual constructionism*. Constructions are created in social interactions, but according to the contextual constructionist view, reality is not reducible to linguistic processes only. Language both reflects reality and constructs it (Juhila 1999: 168; Vehmas 2002: 19-20). Accordingly, wind power plants, the electricity they

produce, and their environmental impacts are thought to be “real”, physical and material, existing independent of human interpretation, but the meaning and value given to each of these issues is a human construct. The constructs are part of human reality, although not of the biophysical world. In this study, the research focus is on the constructionist-side of the approach, and the “real” features of wind power are addressed mainly in describing the wider context (Chapters 4 and 5). I have discussed the physical, chemical and other environmental impacts of wind power elsewhere (Varho 2003a), but in the present work I focus on the social constructs in connection with environmental impacts (Section 6.1).

## 3 Material and methods

This thesis pulls together results reported earlier in Articles I-III. The articles contain detailed accounts of the methodological choices made in designing and analysing the interviews and the questionnaire and in constructing the scenarios. In addition, the earlier results have been complemented with a discourse analysis and a study of Parliamentary documents regarding wind power.

### 3.1 Interviews

The most important empirical material used in this study consists of 25 semi-structured interviews of actors who influence Finnish wind power development. The interviews were conducted mainly in the spring and summer of 2002. I stopped asking for additional interviews when it began to seem that a saturation point had been reached, that is, few new issues or concepts were emerging in the interviews. However, I conducted additional three interviews in 2003 and 2004, as some new specific questions emerged during the analysis. In addition, two interviews were conducted abroad in order to obtain information about the wind power policy development in Germany and Sweden. These interviews helped to put the Finnish experiences and perceptions into an international context. The list of interviewees is given in Appendix 1.

The Finnish interviewees were chosen through co-nomination. I selected the first interviewees from among those who had participated in the *Action plan for renewable energy sources* working group (MTI 1999a), where Finnish wind power targets and ways to reach them were proposed. Co-nomination has been criticised, for if the selection of original interviewees is biased somehow, the final group of participants is likely to be skewed in a similar way. Therefore, the original group was chosen to represent all the relevant fields of the national-level wind power actors: policy makers and administrators, as well as the business community, lobbying groups, and the research sector (see Section 5.4). All interviewees have participated in the development of the wind power sector, but most of them were not limited to wind power alone, however.

Of course, all persons who were asked to participate did not agree. Some declined because they did not think they were suited for the task; for example, some had changed positions since participating in the Action plan working group; others believed themselves to be lacking in sufficient expertise regarding wind power. A few others were too busy, and one politician never responded to my request. On the whole, however, the interviewees represent well the actors who affect the Finnish wind power sector.

The inclusion of representatives from many fields reflects the need to understand different views. Many interviewees had a positive attitude towards wind power, and even a strong interest in its development. However, the group also included persons who were dismissive of wind power and who marginalised its potential and importance. At the time of the interviews, no clear opposing group to wind power existed, but it was nevertheless possible to discover these negative views.

Different fields and organisations each have their own particular expertise to offer to the whole, but they also have their own “set of world views and patterns of interpretation” (Bogner and Menz 2001: 2) that influence how people working within them observe and discuss issues. The goal was to find a variety of views and discuss them in detail, not to map the views of organisations. Accordingly, the respondents were chosen from different organisations, but in this study they only represented themselves and were promised anonymity with respect to individual statements. Anonymity removes the arguments and views from any danger of being labelled on the basis of the person giving them (e.g., Kaivo-oja *et al.* 1997; Kuusi 1999: 181-182). The unexpectedness of some answers seems to indicate that the goal of the anonymity was achieved. It allowed the interviewees to give their views on issues that the organisation might not have an opinion on or that might be somewhat different from their organisations’ “official” line. Anonymity also presumably lessened the interviewees’ wish to lobby or to modify their answers to “politically correct” ones.

Any references to the interviewees are made using the pronoun “he” in order to maintain this anonymity (only two interviewees were female). I have not referred to their answers even by categories, such as “a representative of the administration”. There were three reasons for this. First, all persons have subjective values, which were discussed in each interview, particularly in the context of motives for working with wind power and in connection with hopes for the future. Second, energy sector actors’ roles can be rather fluid, and sometimes an interviewee represented more than one group. For example, some researchers also participate in the activities of the lobbying group called the Finnish Wind Power Association. Third, answers could be quite different, even among representatives of a single group, or quite similar among representatives of different groups. Responses could not be predicted on the basis of the organisation in which an interviewee worked. Therefore, a statement by one representative of a group does not necessarily reflect the views of the other representatives of that group. Using any kind of identifying label could give a wrong impression about the groups to the reader.

The interviews lasted 1-2 hours each and were taped and later transcribed. The thoroughness of the interview obviously depended on the time the interviewee was able to give. Direct quotes have been translated into English by me, together with the list of the interview questions, given as Appendix 2. The questions were not identical in each interview, although the themes and many of the questions remained the same. Often the interview

was more like a discussion, with the interviewee able to influence the order and length in which different topics were discussed. This method has been called a semi-structured interview (Hirsjärvi and Hurme 2001: 47-48).

Some interview questions did not provide much new information, however. For example, the question concerning the sufficiency of information about wind power did not produce clear results. However, I discovered to my delight that, as a method, semi-structured interviews allowed the emergence of new and unexpected views. For example, the importance of the turbine industry as a motive for building wind power capacity in Finland soon became apparent, although I had not thought to include any questions about it. The questions were changed accordingly, so that unproductive questions were sometimes rejected and new questions added in later interviews.

In Article III, also another set of interviews was used. My co-author Suvi Salmela had collected and analysed consumer views regarding barriers to purchasing so-called green electricity and discussed these views in her master's thesis (Salmela 2004) which I helped to supervise. We combined the viewpoints of wind power actors and consumers in Article III in order to broaden the view of green electricity market and the consumers' role within it. Salmela's material has been described in detail elsewhere (III). In this paper I have made few references to her findings and have concentrated on my own empirical material instead. However, working with M.Sc. Salmela certainly influenced the presentation of my own interpretations. The challenge of combining two different perspectives on consumers' behaviour and fitting together the differing theoretical and empirical concepts resulted in an interactive and intense process, and meant that there was hardly a sentence in our article that we did not work on together.

## **3.2 Questionnaire**

Most interviewees (21 of the 25) filled in a questionnaire about the future of wind power in Finland and sent it back before the interview. The questionnaire (which I translated into English for this thesis) is included as Appendix 3.

The questionnaire and the interview question list were drawn up together. The discussion in the interview often followed the topics introduced in the questionnaire. Although early interviews revealed that a few questions in the questionnaire were worded a little ambiguously, no changes were made to it during the process, so that all respondents used the same form.

The respondents described a probable and a preferable image of wind power in Finland for the years 2010 and 2025 by answering the questions in the questionnaire. Perceptions about future wind power capacity, electricity consumption, wind electricity market conditions, technological development, different policy instruments, etc. were asked. A great variety of views was discovered through the answers, so the fact that all interviewees did not wish or did not have the time to fill in the questionnaire did not matter very much.

The views of future, as expressed in the questionnaire and interviews, were constructed into five scenarios about the future of wind power in Finland, as will be described in Section 3.4.

### 3.3 Documents

I also studied a number of government policy documents. The most important were the *Action plan for renewable energy sources* (MTI 1999a), and its update *Action plan for renewable energy 2003-2006* (MTI 2003). These were seen as representing the official Finnish wind power policy. In discussing scenarios about the future of wind power in Finland (I; Section 6.2), the targets and vision described in the official documents were considered one scenario and compared with the five scenarios produced from the empirical material.

Other relevant government documents referring to wind power or renewable energy forms were also used, such as the *Programme for the promotion of wind power production* (MTI 1993a), *Background report for the action plan for renewable energy sources* (MTI 1999b), national climate strategies (Government 2001; 2005), and a working group report on the coordination of emissions trading, energy taxation, and energy subsidies (MTI 2004). Documents from other official sources, such as the Finnish Energy Market Authority and Statistics Finland, as well as from the European Union were used to describe the national development and international context of wind power. The text also contains references to newspaper articles and other media products. Although I have read all Finnish wind power articles in the media that I have found, I have not examined them systematically.

All these documents have been used to understand and describe the Finnish wind power sector (Chapter 5). In addition, the governmental documents have been discussed in the context of the interviewees' perceptions on wind power policy (I-III and Section 6.3, in particular), as well as in Chapter 7. Newspaper articles are referred to mainly in order to illustrate certain issues and their prevalence in Finland.

Parliamentary documents concerning wind power were examined for the years 1993-2005. (It was in 1993 that the first national wind power programme was drafted.) The documents were accessed through the Parliament's Internet service, with the help of their indexing. All documents that had been given the keyword "wind energy" or "wind turbines" were examined. In addition, a number of other documents referring to energy policy in more general terms were examined, when they were discovered to include references to wind power. The Parliamentary documents consisted largely of written or oral questions from Members of the Parliament to relevant Ministers. There were also some governmental reports and motions by Members of the Parliament. Debates relating to these issues in

Parliament were also reviewed. A list of the reviewed documents is given in Appendix 4.

I searched the Parliamentary documents for views and information about political support for wind power and possible attacks against wind power. The results have been used in describing the Finnish wind power actors (Chapter 5) and in discussing the perceptions of wind power policy (Chapter 7). I also examined the way wind power was discussed and referred to in political discourse (Section 6.1). One aim in using this additional material was corroborative (Yin 1994: 92-94), a means of ensuring that relevant views of Finnish politicians did not go unnoticed, since only two Members of Parliament had been interviewed. In addition, observations were made of the level of attention paid to wind power in Parliament and of those who had been active in regard to wind power. These results are reported in Section 5.4.1.

## 3.4 Scenario construction

In order to consider a variety of future images in a systematic and illustrative way and to be able to compare them with the official wind power policy target in Finland, various scenarios were constructed. “Scenario” has been defined in different ways, but essentially it contains an image of the future and describes steps leading to such a future. Scenarios can be used, for example, to create interest in alternative futures and break stale ways of thinking or to help understand how various factors interact to produce a particular situation (Kuusi and Kamppinen 2002: 119-122). The scenarios presented in this study are not to be thought of as predictions. Instead, they are tools to be used when discussing the future and its possibilities.

Dr. Tapio, the co-author of Article I, gave useful suggestions for the construction of scenarios. Although the responsibility of interpreting the results remained mine at all times and although we made all the decisions regarding clustering together (such as the number of clusters chosen), Tapio was more familiar with the mechanics of cluster analysis than I and was mainly responsible for writing Section 3.5, *Cluster analysis*, in Article I. In addition he gave helpful comments on the other sections of the text. Together we developed a new method of scenario construction, which we named “soft” scenarios.

As the basis of the scenarios, we used the numerical answers to the questionnaire. Three key variables were chosen to construct the core of the scenarios, specifically, the installed capacity of wind power in Finland, the electricity produced with said capacity, and the consumption of electricity in Finland. These variables best describe the assumed progress and the role of wind power in the energy sector.

The years 2010 and 2025 were chosen because they are the years used in the *Action plan for renewable energy sources* (MTI 1999a). It would have been analytically clearer to use the evenly spaced years 2010 and 2020, with

the possible inclusion of 2030 as reference points in the scenarios. However, I considered it to be more informative to use the years given in the Action plan, as this made comparisons to official documents possible.

Each respondent was asked to express his/her probable and preferable image of the future in the questionnaire. The probable future was defined simply as the future the person considered most probable, whereas the preferable future was defined as the possible future the individual would most like to see take place (cf. Amara 1981). This approach helped in distinguishing between hopes and assumptions and in bringing to light what the interviewees thought to be the impact of different policies and developments.

The cases were grouped by a hierarchical cluster, a method which groups together responses that are mathematically close to one another. We ended up using five clusters. Each cluster was represented by an arithmetic mean of the questionnaire answers found in that cluster (one for each variable). This made it possible to reduce the number of images of the future from 28 to 5.

The clusters were then combined with the respondents' arguments explaining the numbers to form five scenarios about the future of wind power in Finland. These scenarios were compared with the view expressed in the government documents, as mentioned above.

The questionnaire (given in Appendix 3) was constructed so that the first question was about wind power capacity. Only in later questions did certain factors that affect wind power development appear. Therefore, the personal views about the future were probably constructed "top-down" by the respondents, instead of "bottom-up", possibly contributing to the slight internal inconsistencies in the scenarios.

A downside of the "soft" scenarios method developed in this study was that the scenarios were based on the numerical clusters, and different qualitative arguments could be found to support the same numbers. Therefore, the scenarios were not quite consistent, which limits their usefulness in decision-making. On the other hand, for the very same reason the scenarios were clearly useful in revealing uncertainties regarding the factors that affect the future. The method also allows numerous actors to state their views and increases the transparency of views (I).

### **3.5 Analysis of the interviews**

The interviews were used in different ways during the research. First, in scenario building (I), explanations for the differences between clusters were sought from the arguments given in the questionnaires and interviews. In this content analysis the interviews were considered in the light of descriptions of views, opinions, and arguments. A similar approach was used in the examination of the interviewees' views about consumers and their role



in the electricity market (III) as well as about different policy instruments (II).

During the content analysis I coded and collected for closer analysis statements from the interview transcripts, according to the different research questions. As the analysis progressed during the repeated reading of the material, codes and the concepts to be analysed were modified, as my understanding about the issues increased. Previous findings, theoretical concepts, and models were used to help in the analysis.

In the analysis of the criteria used in valuing policy instruments, I benefited from regulation theory literature, in particular, the lists compiled by Määttä and Pulliainen (2003: 115-121) and Similä (2002). These lists made it easier to recognise and name different criteria that were sometimes expressed in a somewhat indefinite way in the interviews. For example, “dynamic efficiency” was never referred to by that name, but it was an important criterion for many interviewees (see Section 6.3.1).

In the analysis of discourses about different aspects of wind power, discourse analysis was used. This analysis was less about the interviewees’ statements and more about the image they constructed, perhaps unconsciously, of wind power.

According to Tuomi and Sarajärvi (2002: 106), the main difference between content analysis and discourse analysis is that in the former, meanings are sought in texts, and in the latter, the focus is on how these meanings are produced within the texts. My approach comes close to content analysis, since in my analysis of wind power discourses I concentrated both on the content of a discourse, i.e., the claims or arguments, and on the way these arguments are presented, i.e., the tone of the argument. Using this approach enabled the study both of what people consider worth discussing and the tools they employ to convince others.

Discourse analysis often contains elements from rhetorical and/or argumentation analysis (e.g., Leiwo and Pietikäinen 1998: 103; Jokinen *et al.* 2004: 10). The approach used in this study is no exception. However, there is no attempt to consider the “goodness” of arguments (cf. e.g., Kakkuri-Knuuttila and Halonen 1998: 76-113). In this study I am more interested in the existence of views than in how well they have been argued by speakers. The attention is on the overall image of wind power, as produced by the interviewees and other actors in Finland. I have not separated each argument and the structure of its grounds, but rather looked for larger entities. Rhetorical tools have received less attention than the content of views, but they have been discussed where their use has been particularly distinctive. In addition, much attention has been paid to the context of the Finnish energy sector in the beginning of this century, i.e., the environment where the discourse is formed.

I identified the discourses largely according to their function or consequence (cf. Jokinen *et al.* 2004: 41-45). This functional approach served to show what may follow from discussing wind power in a certain way. The

discourses can be deliberately used to serve a specific function, but their use may also be unconscious or serve a function other than the one intended.

## **4 The international context: wind power in the world**

Finnish wind power does not exist in isolation. Rather, its development is part of global wind power development. The Finnish wind power industry has benefited greatly from the growth of the global market. In this chapter, I will describe the international context of this field: the growth of a “new” form of electricity production from the 1970s to the 21<sup>st</sup> century, its technological development, and the variety of wind power policies in forerunning countries. I will focus on those countries where wind power has taken the most significant steps over the years, namely Denmark, the USA, and Germany. Although wind power has now been introduced to most European countries, and is also expanding in developing countries, its global development owes much to a very small number of countries. Familiarity with the development of wind power in these countries will make it easier to understand the views of Finnish actors as well.

Although much literature exists on wind power development, few sources consider more than one country or examine such development comprehensively over several decades. Therefore, in writing this chapter, I have relied much on a doctoral thesis by Janet L. Sawin (2001), as she studied the technological development, growth of capacity and wind power policies over several decades in the USA, Denmark and Germany – precisely those countries where the most significant wind power development took place during the 1970s, 1980s and 1990s.

### ***4.1 Growth of capacity***

The power of wind has for centuries served to move ships, to mill grain, to pump water, and to perform many other tasks, such as to dry laundry. Even the history of electricity production with wind is older than often thought, beginning as early as 1891 by Danish scientist Poul La Cour (Olivecrona 1995; Sawin 2001: 249). During both World Wars, the Danes used wind turbines to meet domestic electricity demand (Gipe 1991). Wind power was used in other countries as well during the first decades of the century, but period from the 1940s to the 1970s saw little wind electricity production (Golob and Brus 1993: 131).

It was not until the energy crises of the 1970s that the search for alternatives to fossil fuels began in earnest. For example, Hadjilambrinos (2000) described how France and Denmark, faced with similar problems in 1973, began to move in completely different directions. France chose the rapid expansion of nuclear energy, whereas Denmark began a very different process that would make Denmark a country known for wind power.

Denmark is in many ways an exceptional country in wind power, but perhaps the most unique feature is the way wind power developed through individual ownership and, in particular, co-operatives. Denmark has a long

and strong tradition of small-scale ownership in the energy sector (Hadjilambrinos 2000). The government supported private ownership in many ways. Many Danish farmers erected small turbines on their farms, and by the 1990s more than 100,000 Danish households owned or co-owned a wind turbine and the Danish windmill owners' association (*Danske Vindkraftværker*) had become a powerful lobbying organisation (Hadjilambrinos 2000). In 1999, 85% of Danish capacity was owned by individuals or co-operatives. This has resulted in the increase and maintenance of local acceptability of wind turbines, which may in fact partly explain the government's encouragement. On the other hand, because utilities initially opposed wind power, it was the public interest and private instalments of wind power that enabled the growth of the sector (Sawin 2001: 274-276, 294-295).

Another significant forerunner in wind power was the United States. In fact, although the Danish wind turbine industry was the most successful, the United States had much more installed wind power capacity than any other country until the early 1990s. During the 1980s, California was the dominating market; by the end of 1991, capacity totalling 1,679 MW had been installed there, representing 77% of the world total. The pace slowed down in the 1990s, however, and in the year 2000, Californian capacity remained under 1,700 MW, then less than 9% of global capacity. The rest of the USA began to catch up with California during the late 1990s, pushing total American capacity over 2,500 MW by the year 2000 (Sawin 2001: 149, 223-225).

The 1990s, in turn, were dominated by the phenomenal expansion of the German market. Sawin (2001: 301) describes this expansion as follows:

“A mere ten years ago [ca. 1990], Germany's wind industry was small and technologically obsolete, and installed wind capacity was close to zero. Then suddenly the market took off; between 1993 and 1999, German wind capacity increased at an average annual rate of nearly 60 percent. Germany surprised the world by surpassing US capacity levels in 1997”.

This development continued throughout the 1990s and beyond, so that by the end of the year 2005, Germany's capacity was 16,629 MW (Eurostat 2006; EWEA 2006).

This development fostered the growth of German technology and new companies, and contributed to the technological development of ever larger turbines. Of course, this development has included the production of electricity with wind: in the year 2005, German wind electricity production exceeded 26 TWh, accounting for some 6% of all electricity consumed in Germany (BWE 2006).

Although this expansion is now recorded history, we should remember that this outcome was not always clear in Germany. By the end of 1992, the future was quite uncertain: subsidy programmes had been flooded with applications and were stalled, utilities and industrial actors objected to the

high price of wind electricity, and environmental activists had opposed several projects (Holttinen 1993: 46-47).

**Table 1.** Wind power capacity (MW) in 1985-2000 (Eurostat 2006) and in 2005 (EWEA 2006), the share of gross wind electricity generation of total gross electricity generation in 2005, and the share of net wind electricity generation of electricity consumption in 2005 (Eurostat 2007) in twenty-five EU countries<sup>2</sup>.

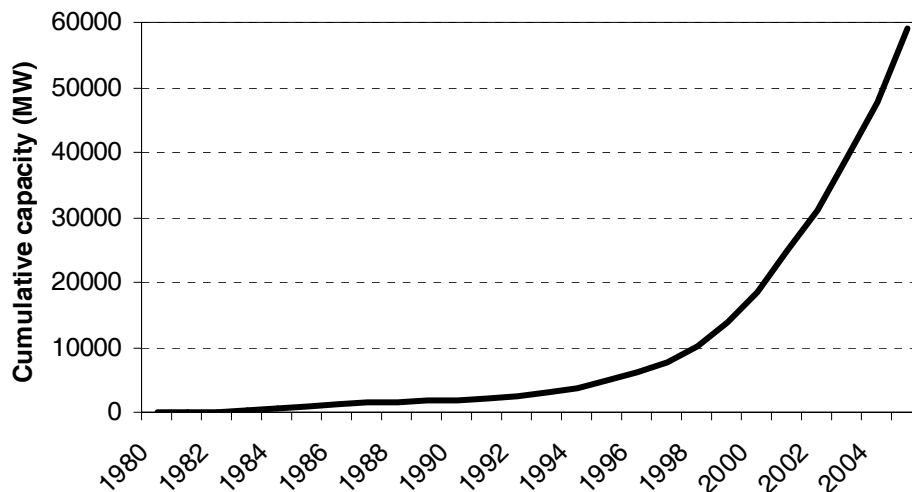
	1985	1990	1995	2000	2005	% of generation	% of consumption
Austria	0	0	1	54	819	2.0	2.3
Belgium	0	5	5	14	167	0.26	0.28
Cyprus	na	na	na	na	0	0	na
Czech Republic	na	na	na	na	26	0.03	0.04
Denmark	50	343	616	2,814	3,122	18	20
Estonia	na	na	na	na	30	0.53	0.90
<b>Finland</b>	<b>0</b>	<b>0</b>	<b>6</b>	<b>38</b>	<b>82</b>	<b>0.24</b>	<b>0.21</b>
France	0	0	4	55	757	0.17	0.23
Germany	0	48	1,137	6,095	18,428	4.4	5.3
Greece	0	2	27	226	573	2.1	2.5
Hungary	na	na	na	na	17	0.03	0.03
Ireland	0	0	6	116	496	4.4	4.6
Italy	0	3	22	363	1,717	0.77	0.78
Latvia	na	0	0	2	27	0.96	0.82
Lithuania	na	na	na	na	7	na	na
Luxembourg	0	0	0	14	35	1.3	0.84
Malta	na	na	na	na	0	0	na
Netherlands	0	57	257	442	1,219	2.1	2.0
Poland	0	0	0	4	73	0.09	0.14
Portugal	0	1	8	83	1,022	3.8	3.8
Slovakia	na	0	0	0	5	0.02	0.03
Slovenia	na	na	na	na	0	na	na
Spain	0	7	115	2,274	10,027	7.2	8.7
Sweden	10	7	67	209	500	0.59	0.71
United Kingdom	0	10	200	412	1,353	0.73	0.84
<b>EU-25 total</b>	<b>60</b>	<b>483</b>	<b>2,471</b>	<b>13,215</b>	<b>40,502</b>	<b>2.2</b>	<b>2.6</b>

<sup>2</sup> The Eurostat (2007) has somewhat different values for Finnish electricity consumption, for example, than Finnish statistics do. However, the purpose of the last two columns is to give an indication of the relative importance of wind power in different countries. Although some differences clearly exist in statistical practices, the use of values from this single source only should make the numbers given in this table reliable enough for my purpose.

The newest runner in the “capacity race” is Spain, with over 10,000 MW of wind power capacity by the end of 2005. The growth of Danish capacity, on the other hand, has stalled: growing from approximately 2,800 MW in the year 2000 only to some 3,100 MW in 2005 (Eurostat 2006; EWEA 2006). Although other countries have surpassed Denmark in wind power capacity, wind electricity’s share of total electricity production is probably still the highest in Denmark, having been 12-18% in 2000-2005 (Eurostat 2006; 2007) (see Table 1).

The European Union total exceeded 40,000 MW by the end of 2005 (EWEA 2006), and wind power capacity in 2003 produced approximately 2.4% of the EU’s total electricity consumption (European Commission 2004) (see also Table 1).

Outside the western world, India is the foremost wind power state, although other developing countries are also beginning to invest in wind power. In fact, India already possesses more wind power capacity than Denmark, ranking 4<sup>th</sup> after Germany, Spain and the USA in 2005 (GWEC 2006).



**Figure 2.** Global cumulative wind power capacity in 1980 – 2005. Sources: Brown et al. (2000); BTM Consult ApS (2002); GWEC (2006).

Wind power markets have grown very rapidly. In 1991, total world capacity reached 2,000 MW, but beginning in 1998, more than 2,000 MW were added in a year (Brown *et al.* 2000). By 2005, global capacity had reached nearly 60,000 MW (GWEC 2006). Global cumulative capacity<sup>3</sup> in 1980 – 2005

<sup>3</sup> Global wind power data, in particular data from the early years, remain somewhat uncertain because the conventions of recording data have varied considerably (Sawin 2001). Even now, wind power capacity statistics for the year 2005 by EWEA (2006) and Eurostat (2007), for example, differ slightly. This uncertainty does not, however, affect the overall trend.

appears in Figure 2. Although the total market has grown rather smoothly, growth in individual countries has been erratic.

## **4.2 Technological development**

Wind turbine technology has developed rapidly. Over the years, turbines have been made in different sizes and shapes and from various materials, but the model with three blades, horizontal axis and a tubular steel tower has become the norm (McGowan and Connors 2000).

Although the general style of a turbine has become standardised, development certainly has not stopped. It is sometimes hard to keep in mind how very fast the development has occurred. One of the signs of this rapid development has been increasing turbine size. A decade ago, Street and Miles (1996: 418) wrote that “the height of machines (height of hub above ground) seems to be fairly stable at 30-40 metres, though there are experimental machines of much greater height, which show some promise”. Today, heights of 70-90 metres are commonplace.

The physical size of a turbine is directly related to the power it can produce. Production depends on rotor size and wind speed, and higher towers allow for larger rotors and are able to reach the stronger winds that blow at greater heights above the ground. The increase in production per turbine has made possible the production of offshore wind power. The costs of foundations, as well as of operation and maintenance, would be prohibitively high for small turbines. In fact, the dream of offshore wind parks was one of the factors driving the rapid growth of turbines.

In 1993, Golob and Brus (1993: 150) reported that “Although some countries are continuing research in large-turbine technology, most wind industry analysts now believe it is unlikely that multimegawatt turbines will ever be routinely used for power generation”. Street and Miles (1996: 418) were a little more optimistic: “In 1986 the average size was around 80 kW of rated power; by 1990 it was approaching 200 kW. [...] Systems of 500+ kW are liable to be widely installed in the next decade, and systems of twice or even three times this capacity are on the cards”. Today, turbines of 1-3 MW are being installed on a regular basis.

The pessimistic views of the (early) 1990s were an understandable result of the failures of the 1970s and 1980s. The first wind power technology programmes were often based on expertise in aerodynamics and aircrafts and directed at large turbine development. They were not particularly successful (Sawin 2001; Kamp 2002).

Instead, the most successful line of Danish research and development (R&D) and production began with small entrepreneurs and small-scale turbines (Olivecrona 1995). One Finnish interviewee jokingly described the early years as follows: “*In Denmark [...] they were building the turbines behind barns – not even in the barns*”. At the same time, however, some producers of agricultural machinery saw their markets dwindle, and directed

their development efforts to wind power. Some of the largest turbine manufactures, such as Vestas and Bonus, entered the market in this way (Sawin 2001: 257).

Governmental R&D funding in Denmark was largely directed at large turbines. However, the Danes also paid close attention to reliability and type approval, cost reduction, grid integration, and the collection of wind data. In addition, Denmark possessed a large network of actors, including researchers, manufacturers, and turbine users, who learned much from one another (Kamp 2002).

Since the mid-1980s, Californians began to import turbines, mainly from Denmark, because American R&D efforts concentrated on larger turbines, and the imported smaller turbines were more reliable than domestic ones (Sawin 2001: 222). In the end, the Danes became the forerunners of the technology. In 1990, Danish turbines commanded a market share of 78% in Europe and 45% globally (Olivecrona 1995). The Danish turbine industry dominated the global market for a long time. Competition has increased, however, in the 21<sup>st</sup> century the as new companies in various countries have entered the market.

Not only has the size of turbines grown but also that of wind parks. New turbines are often installed in wind power parks which can have tens or hundreds of turbines. Such park projects can therefore produce several hundred megawatts. The reliability of turbines has also increased dramatically, from about 60% availability for power production in the early 1980s to 98% by the year 2001 (Sawin 2001: 46). In Finland, where problems with icing occur, for example, the availability was some 95% in 2003-2005 (Laakso 2004; Holttinen 2005a; Holttinen 2006).

Similarly, the capacity factor, or the ratio of the actual average production of a turbine to the amount of electricity it would produce if operating at maximum power all the time, has increased significantly. This factor depends partly on wind conditions at the site; the best Finnish turbines have had a capacity factor of some 35-40% measured over 12 months, whereas badly placed and older turbines have had a capacity factor of under 15%. The best results have occurred with the megawatt-class turbines built in the 21<sup>st</sup> century (Holttinen 2005b). This is a clear indicator of the improving cost-effectiveness and competitiveness of wind power.

Experience acquired through the growth of cumulative capacity and the increasing bank of R&D-based knowledge have led to a rapid decrease in wind power costs. Wind electricity production costs in Denmark fell some 87% between 1981 and 1999 as a result of greater turbine size, reduced weight, improvements in turbine productivity and reliability, and better site selection. The installed costs (turbine plus installation) of a medium-sized turbine declined from about USD 4,000 / kW in 1980 to USD 900-1,200 / kW in 2001 (Sawin 2001: 48). Leino *et al.* (2004) estimate average instalment costs of EUR 700-900 / kW in 2010 internationally. Finnish costs are higher, because projects and market volume are small. These days, a rule of thumb in Finland seems to be about EUR 1,000 / kW for onshore installations,



although cheaper projects have also been realised (Holttinen 2001; Leino *et al.* 2004).

### **4.3 Wind power policy**

Although costs may seem the most obvious barrier slowing wind power development, technical, bureaucratic, legislative, and political aspects also cause problems. Technological standards for turbines, streamlined permit and decision making processes, and wind resource studies are all policies that have influenced wind power development. Another important issue is siting (i.e., finding suitable sites for wind turbines). In Denmark, for example, a 1994 national planning directive required municipalities to plan for wind turbine siting. The government also demanded that utilities build wind power capacity. The result was not only increased capacity in the country, but utilities acquired experience in wind power, and their opposition to wind power declined (Sawin 2001: 260-265).

However, in this study I concentrate on wind power markets and market-related instruments. These instruments have had a very crucial impact on wind power development. For example, during most of the 1980s and 1990s, the new capacity built in California was much more than that built in the rest of the USA. This depended at least partly on specific Californian legislation that was financially more supportive of wind power than were Federal policies (Sawin 2001: 227-230).

#### **4.3.1 Motives**

Policy making is sometimes presented as a policy cycle. For example, Howlett and Ramesh (1995: 11-12) describe a policy cycle as consisting of agenda setting, policy formulation, decision-making, policy implementation and policy evaluation, after which the process can start from the beginning. This model is necessarily simplified, and Howlett and Ramesh note that policy making is rarely this orderly and linear.

The model assumes a single approach to a single problem. In wind power, however, we can ask whether the problem is climate change, resource depletion, or perhaps dependence on imported energy. Wind power is only one of many tools that can be used to solve these problems, but this is set aside in practical wind power policy formulation. Once wind power has been chosen as one of the solutions, or as one of the forms of energy to be developed, small wind electricity production becomes the problem. Even then, questions can arise about more specific targets: for example, is the target the development of wind power technology or the number of erected wind turbines?

The motivations for wind power development and policy have changed over the years. Before the 1970s, wind was merely one way of generating

electricity, useful particularly when alternatives were scarce. Wind's benefits have always included domesticity, and when Danish wind power policy began in 1976, for example, it aimed mainly at reducing the country's dependence on imported energy. By 1990, however, the focus had shifted to environmental problems, and the goal was to reduce greenhouse gas emissions in particular (Olivecrona 1995). Today this concern for the climate remains behind the increasing global interest in wind power. Finland also views renewable energy sources as one way to reach the emission reductions required by international agreements (e.g., MTI 1999a; Government 2001).

However, the old benefits are also still important, perhaps now more than ever. Renewables continue to be supported in order to increase the security of the energy supply and to reduce dependence on imported energy (e.g., European Commission 2000).

In addition to the benefits of wind electricity production, wind power industry has become important in itself. The success of the Danish industry in the 1980s encouraged political actors in different political parties in Denmark to support wind power. In fact, contrary to the view of Olivecrona (1995) noted above, Holttinen (1993: 44) states that the strong support for wind power was in the early years based on industrial rather than energy objectives. By 1996, the Danish government had announced its goal to keep Denmark at the forefront of sustainable technology and to reap economic benefits from wind technology (Sawin 2001: 252, 296).

### **4.3.2 Targets**

Targets for wind power expansion have changed over and over again. For example, in 1978, the California Energy Commission set a target of 10,000 MW of Californian wind power capacity by the year 2000, but only three years later they estimated the potential at a mere 1,300 MW (Sawin 2001: 208-209). Such changes reflect the uncertainty of the first years and the problems the technology faced. They also reflect changes in the political climate.

In 1997, the European Wind Energy Association (EWEA) set a target of 40,000 MW for the fifteen EU member countries in 2010. Three years later they raised the target to 60,000 MW, and another three years later to 75,000 MW. They also set a target of 180,000 MW for 2020 (EWEA 2003). This clearly illustrates the rapid growth of installed capacity and the optimism it has generated in the industry.

### **4.3.3 Research and development policies**

Research and development (R&D) funding has always played a significant role in wind power policy globally. In the beginning, many assumed that wind power technology could be relatively easily derived from existing

technology, and that large wind turbines were necessary to achieve significant electricity production. Consequently, much of R&D funding was spent on megawatt-scale turbines that were being developed with aerospace corporations (Olivecrona 1995; Sawin 2001: 100, 113-114, 304).

R&D funding was much higher in the USA than in Denmark or Germany, even including the funding the latter received from EU funding programmes (especially JOULE-THERMIE). American funding, however, was less efficient. Reasons for this include a top-down approach, where the general model of turbines and their sizes were determined by officials, where R&D companies did not invest their own funds into research, and where the views and experiences of users were not recorded and incorporated into research activities. American R&D funding was unsuccessful in promoting the domestic wind turbine industry, and the most successful American company received no Federal R&D funding (Sawin 2001: 179).

After the failures of the early years, more funding was directed towards smaller turbines. However, pressure to build ever larger turbines continues. Sawin (2001: 307) noted that around the turn of the century, much of the funding again went to large turbines and that “there is concern among many in the wind community” that not enough attention is being paid to the problems of existing turbines. Dr. Jochen Twele, a representative of the German wind power association, expressed a similar view. He thought that the demand for new, larger turbines has prevented manufacturers from correcting minor problems and perfecting their designs. This may even have kept the turbine costs high (Jochen Twele, Bundesverband WindEnergie e.V., personal communication, 9 December 2002).

#### **4.3.4 Economic instruments**

Wind power has been supported through different economic instruments around the world, such as investment subsidies and tax credits. The most effective method seems to be some sort of *guaranteed price* or *feed-in tariff*, as such policies have produced massive waves of turbine construction in the USA, Denmark, Germany, and Spain (e.g., Sawin 2001; del Río and Gual 2004). These policies have, however, been subject to criticism, often because they have not been considered cost-effective (e.g., Michaelowa 2005).

This type of instrument was first introduced in the USA. Federal and Californian policies consisted, most importantly, of a guaranteed market for wind electricity at a regulated price. The Public Utilities Regulatory Policies Act (PURPA) of 1978 required utilities to buy power generated by small producers of renewable power at rates based on “avoided costs” to the utility, or costs the utility would pay to generate or purchase the power in the absence of the small producer (known as a qualified small facility, or QF) (Sawin 2001: 117-118).

The majority of Californian capacity was constructed under a similar system known as Interim Standard Offer 4 (ISO4), which allowed QFs to sign

contracts with utilities for up to 30 years with a guaranteed price for a third of the contract time. ISO4 was crucial in encouraging investment in wind power because it made securing financing for wind power projects much easier (Sawin 2001: 195-197, 232, 236).

Probably the most important element in the rapid growth of the German wind power sector was the Electricity Feed Law, which came into effect in January 1991. This law required utilities to buy all wind electricity produced in their supply area for at least 90% of the retail rate. As there are large regional differences in wind power production in Germany, most capacity being in the north, the law affected different utilities to various degrees. Therefore, from 1998 to 2000, renewable electricity was capped at 5%. The system was revised in 2000 in the Renewable Energy Law. Under this system, tariffs set specifically for wind electricity depend on the wind conditions of a particular site, so that the tariff is higher on sites with lower wind speeds than on sites with higher wind speeds. Tariffs for each project are set for 20 years, but tariffs for subsequent projects are reduced by a certain percentage per year. This system favours early movers and reflects expected decrease in production costs. This law abolished the five percent cap and distributed the extra cost of renewable electricity more evenly among utilities in different parts of the country (Sawin 2001: 309-310; Jochan Twele, Bundesverband WindEnergie e.V., personal communication, 9 December 2002).

Another model of support for renewable energy is what is known as *tendering* or *bidding*. In this system, the government invites electricity producers to bid for government support. Those producers who offer either to produce the most electricity with a given amount of support or to produce a given amount of electricity with the least amount of support get to realise their projects. Such systems have been used in the UK and Ireland. These systems tend to have high administrative costs and complex bidding processes, and can result in start-and-stop market growth rather than steady growth (del Río and Gual 2004). The UK decided to implement a system based on green certificate quotas around the turn of the century (DTI 2000).

Tradable *green electricity certificates* mean “separating” the environmental nature of electricity from the actual electricity in the form of certificates, and creating a separate market for them. This allows the producers of renewable electricity to generate revenue from green certificates on top of the price of the electricity itself. As in the UK and Sweden, the system is often combined with a quota for renewable electricity which the electricity suppliers must meet. This sets the quantity of required renewable electricity production and leaves the setting of prices to the market. Feed-in tariffs, in turn, set a guaranteed price for renewable electricity, and allow the market to determine the quantity.

Del Río and Gual (2004) call these three policy systems (guaranteed price, bidding/tendering and green certificates) main or primary instruments to support renewable energy. Supplementary instruments have included subsidies, fiscal or financial incentives and green pricing.

In Denmark, for example, wind power has been supported in past decades through many types of policies such as tax policies, instalment subsidies, production-based subsidies, fixed rates for wind electricity, and government orders and agreements with utilities to develop wind power capacity. High energy and CO<sub>2</sub> taxes have also improved the competitiveness of wind power (Sawin 2001: 258-262, 266-269).

Green pricing cannot really be seen as a policy instrument, as it is based on the voluntary action of both the participating companies and consumers. In general, however, the voluntary market of green electricity has become increasingly important in Europe in the 21<sup>st</sup> century following the ongoing liberalisation and deregulation of electricity markets. In addition, governmental policy instruments, such as consumer information policies or funding the information distribution efforts of wind power associations can influence market behaviour.

#### **4.3.5 The importance of policies**

Sawin (2001: 291) summarised the importance of target setting well by describing the impact of a 1996 Danish programme thus: “With a planning horizon of 30 years, Energy 21 called for 5,500 MW of installed capacity in Denmark by 2030. This sent strong signals to the market: significant amounts of new wind capacity would be required in the future, the government would support this endeavour, and the wind industry was a good place to invest one’s money”. Danish capacity grew from 616 MW in 1995 to more than 3000 MW by 2003 (Eurostat 2006). Naturally, this development was not the exclusive result of target setting, but the targets certainly contributed to the trust that market actors had in wind power. On the other hand, targets mean little without consistent policies. Sawin (2001: 358) noted that American Federal and Californian wind power goals were often idealistic, and the policy to reach such goals was not implemented, at least not consistently. According to her, American policies drove the goals, whereas in Denmark and Germany, the goals drove national policies.

On a more general level, the importance of energy visions and targets becomes clear in light of recent developments in energy production. One of the interviewees in this study complained about the lack of vision of many actors in the energy sector. He noted that in the beginning of the 1970s, Finnish electricity was to a large extent produced with hydropower and oil, and in three decades the diversity and volume of electricity production has increased enormously. Could not equivalent changes also take place in the future? A collection of articles edited by Silveira (2001a) describe similar historical changes in Sweden. Silveira (2001b) notes in her own article that a lesson to be learned from past experiences is that ambitious goals, political leadership, and plurality of both energy forms and policies are needed in order to achieve sustainability. At the same time, she draws comfort from the knowledge that change has been possible; it is possible in the future as well.

The wind power policies of the three countries (the USA, Denmark, and Germany) that Sawin (2001) reviewed included the goal of developing new technology, jobs and export income. This goal in itself does not contradict the goal of increasing wind electricity production, as improvements in technology have made investment in wind power economically reasonable. On the other hand, the expansion of the wind electricity market did not succeed in any of these countries without policies that helped to create the market. Technological development alone has been insufficient to break the hold of established energy forms.

The most effective policy for capacity growth seems to be one which guarantees a sufficiently high price for wind electricity for a sufficiently long period of time. Such policies have resulted in growth in California, Denmark, Germany, and Spain. The stability and consistency of policies are also crucial elements. The American experiences have shown that inconsistent policies lead to dramatic periods of boom as well as to periods of stagnation and bankruptcies (Sawin 2001).

Why then is wind power policy not stable and effective everywhere? Sawin (2001: 432) provided one possible answer:

“If they [wind and other renewable technologies] are viewed as technologies of the future, such alternatives will never become technologies of the present; governments and their citizens will continue to wait for that just beyond the horizon. In the United States, wind is viewed as a marginal source of energy, whereas in Germany and Denmark it is seen as having a major role to play, today, in national energy strategy. The commitment with which governments address such technologies impacts both the seriousness and extent of government policy, and the perception of that technology held by the public and potential investors.”

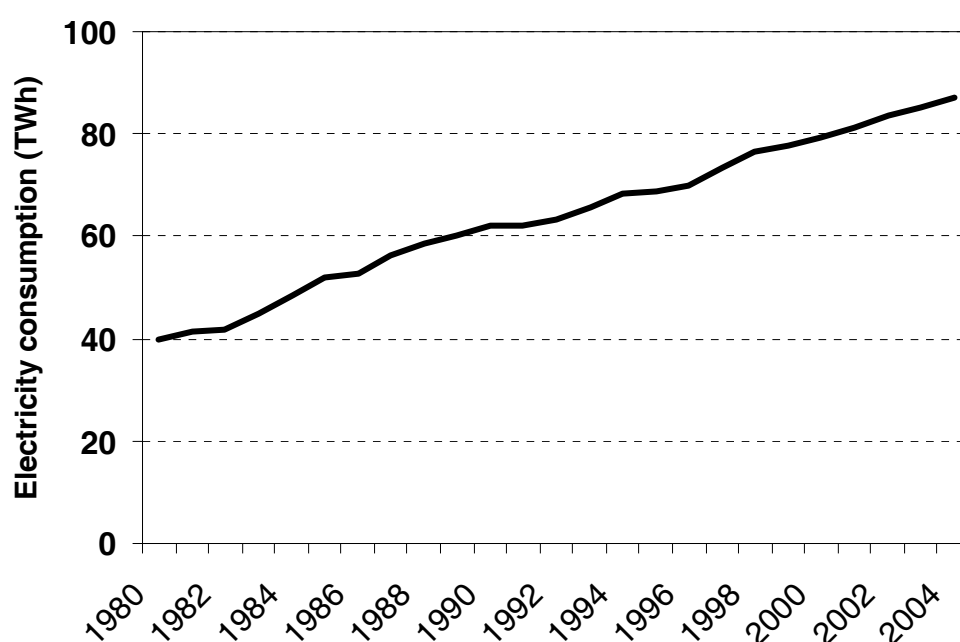
In a speech following a conference workshop on different countries' experiences with wind power, Dr. Peter A. Strachan offered another possible answer when he expressed his amazement at how little countries learn from each others' policies (Strachan 2005). In reviewing the policies and results of different countries, it seems that nations often repeat the same mistakes. Indeed, the harmonisation of energy policies has proven to be very difficult (Tews 2005).

In addition, stability and effectiveness are only two of the many criteria that are used to measure the value of policy instruments. The variety of criteria used by Finnish wind power actors will be discussed in Section 6.3.

## 5 Finnish wind power

### 5.1 Finnish electricity sector development

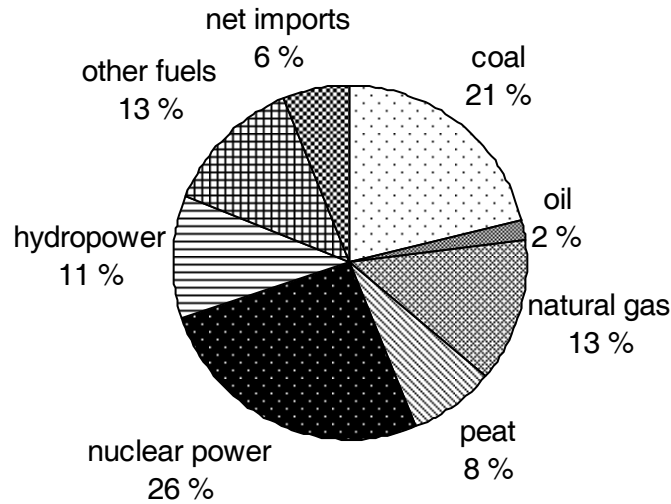
Electricity consumption has grown rapidly in Finland: since 1970 the growth of yearly consumption has been about 20 TWh per decade and in the year 2004 it was about 87 TWh (Fig. 3). Factors contributing to the rapid growth include the increasing production and consumption of goods, direct electric heating in households, and the increased use of electricity instead of heat or steam in industrial production processes.



**Figure 3.** Electricity consumption in Finland 1980-2004. Source: MTI (2005).

Finland has a large variety of electricity production forms. Nearly a quarter of electricity consumed in Finland is from renewable sources (Statistics Finland 2004). It is one of the highest shares within the European Union. However, Finnish renewable electricity production is mainly from hydropower and wood fuels (which account for the majority of “other fuels”, see Figure 4), and wind power lags far behind. The wind electricity production was 0.17 TWh in 2005, some 0.2% of the electricity consumed in Finland (Holtinen 2006).

The shares of different energy forms change somewhat yearly, depending mainly on the rainfall. Much of the Nordic electricity supply comes from hydropower, particularly in Sweden and Norway, and the availability of water affects both electricity prices and the share of other energy forms.



**Figure 4.** Electricity supply in Finland 2003 by source. Source: Statistics Finland (2004).

In order to lower carbon dioxide emissions from energy production, renewable energy forms are supported through different policies. Climate change was also one of the arguments used in the debate about additional nuclear capacity a few years ago. In Finland, building nuclear power plants requires permission from Parliament. In 2002, Parliament accepted the building of a fifth nuclear reactor. The alternative was often seen to be increased use of natural gas to replace coal. Renewables were expected to be needed regardless of the nuclear decision.

One of the most important recent developments in the energy sector has been the reform of the electricity market. It took place in Finland and other Nordic countries in the 1990s. The process included both liberalisation, i.e., dismantling monopolies and opening the trade to competition, and deregulation, i.e., reducing government intervention in the market (Vehmas 2000). However, the Finnish electricity market has been described as exceptionally “free” even before the deregulation and liberalisation of the 1990s, as there were a large number of both public and private electricity production companies and a wide variety of energy sources in use (Pineau and Hämäläinen 2000). In fact, Ruostetsaari (1998: 49) found the distributed ownership of companies to have been a factor that facilitated the reform.

The initiative for the reform came from the government. Initially, companies were against it, partly because they feared increasing government regulation in the market (Ruostetsaari 1998: 51). “Openness” and “freedom” of the electricity market have become extremely valued characteristics in the Finnish energy sector, as will be discussed in Section 6.3.

Liberalisation has allowed Finnish consumers to choose their electricity suppliers more freely. Distribution is still always carried out by a local operator, but the supplier of electricity can now be anywhere in the country.

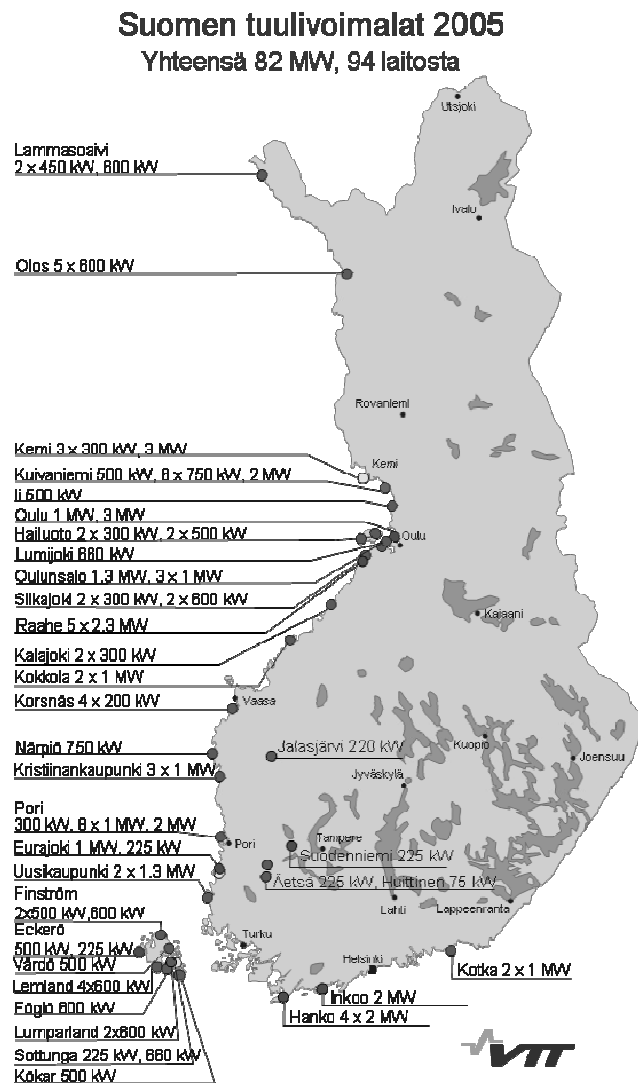


This means that it is possible for an inhabitant in Helsinki to buy electricity produced in a wind power plant hundreds of kilometres away, in Pori, for example<sup>4</sup>. Household consumers have not become very active in the market (see Sections 5.3.3.3 and 6.3).

## 5.2 Finnish wind sector development

In Finland the use of wind for electricity production began with a 300 kW turbine in Kopparnäs in 1986. A small (65 kW) test turbine was erected at Paljasselkä in Lapland in 1991, and in the same year four turbines of 200 kW each started operation in Korsnäs. The first national wind power research project NEMO started in 1988, and the first national wind power programme dates from the year 1993.

Wind power production is necessarily somewhat unevenly distributed in Finland. Because the forests cover much of the land, the best wind conditions are found on the coast, in the archipelago, and on the fells of Lapland. The offshore and coastline potential of the Bothnian Bay and Kvarken on the west coast of Finland was estimated as 5,400 MW in a study where the technical, economic and environmental constraints were taken into account (Ministry of the Environment *et al.* 2003). The majority of Finnish turbines have been built to coastline and islands (Fig. 5) although some

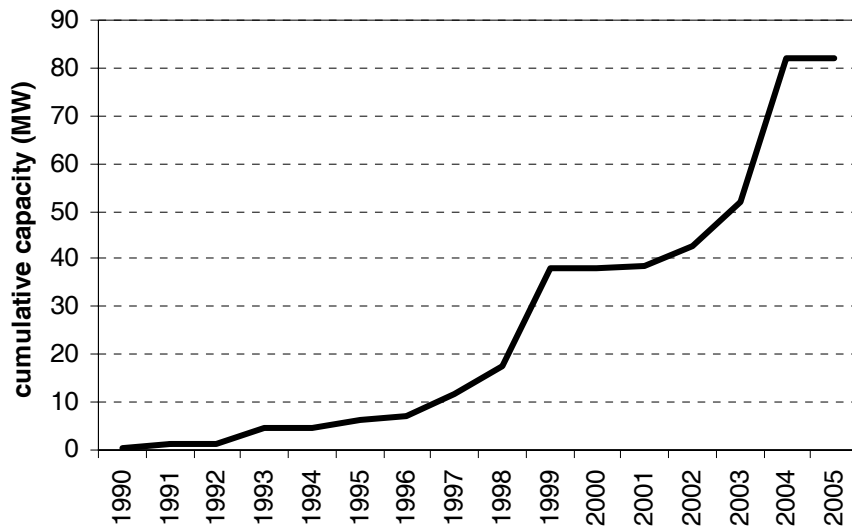


**Figure 5.** Wind power plants in Finland, 2005. Source: Holtinen (2006). Reprinted with permission.

<sup>4</sup> Actually, electricity is always supplied by a power plant close by, and the idea of green electricity merely involves directing a consumer's money to certain forms of electricity production and to the producers of such electricity; it is not concerned with delivering that product to the consumer's home. Sufficient demand for green electricity will, however, reduce the operating hours of production plants using non-renewable resources.

of them have been built by inland companies (see Section 5.4.2). Projects are typically very small.

The cumulative Finnish wind power capacity is shown in Figure 6. Finnish capacity has grown intermittently, but this is partly coincidental. The number of turbines is still so small in Finland that one or two projects can represent significant growth in percentage terms. However, according to Leino *et al.* (2004), the rapid growth in 1998-1999 was partly a response to the demand for “green” electricity, which was anticipated on the basis of market research. When the demand did not materialise and prices for electricity were low, further capacity was not taken into use. Since 2002, new investments were made in wind power; as the technology continued to improve, electricity prices rose – and were expected to rise further as a result of the EU carbon emission trading – and Finnish companies wished to help the new Finnish turbine manufacturer *Winwind* to get a favourable start (Leino *et al.* 2004). Small market volume and small-scale projects have contributed to high instalment costs (EUR 1,000-1,100 / kW on average in 2004). Internationally the average costs were some EUR 800-1,000 / kW in 2004 (Leino *et al.* 2004).



**Figure 6.** Finnish wind power capacity 1990-2005. Sources: Laakso and Holttinen (2001); Laakso (2004); Holttinen (2006).

At the end of the year 2005, Finland was 14<sup>th</sup> in the European Union in wind power, with 82 MW, according to EWEA (2006) (see Table 1). Behind Finland were Luxembourg and the ten newly joined member states, four of which installed more wind power capacity in 2005 than Finland (EWEA 2006). Countries vary in regard to total electricity production and consumption capacities, for example; and in terms of the share of total gross electricity generation, Finland was in 16<sup>th</sup> place among the twenty-five EU countries. In

terms of the share of wind electricity generation of electricity consumption, Finland's ranking fell to 17<sup>th</sup> place (Eurostat 2007, see Table 1).

Finland has also a notable wind power industry. It produces wind turbines as well as materials and components for them, such as steel, glass-fibre, drives, and generators. The export value of this industry was over 200 million euros in 2002 (Holttinen *et al.* 2002). That amount represented some 0.4% of the total value of Finnish exports, which was 47,100 million euros (Finnish Customs 2003). Representatives of the wind power industry have been disappointed with the export value remaining at approximately 200 M EUR / year since 2002 but continue to believe in considerable growth potential (Virtanen 2005; Antila *et al.* 2005a).

The Finnish situation is unique, because there is a turbine industry without significant wind power capacity. In 2002, the Finnish wind power components had a global market share of approximately 5%, while the installed capacity in Finland was only about 0.2% of the global capacity (Holttinen *et al.* 2002). As a result of the slow development in Finland, both shares have decreased since then. In the end of the year 2005, the Finnish share of the markets was some 2%, and the share of the global installed capacity was 0.14% (Antila *et al.* 2005a; GWEC 2006).

### 5.3 Finnish wind power policy

In this section I will describe Finnish wind power policy. As Finland is also a member of the European Union, I will first briefly describe EU policies regarding renewable energy.

#### 5.3.1 The European Union's renewable energy policy

European Union has promoted renewable energy actively. The motives to do so include climate change, security of energy supply, increasing dependence on and rising prices of imported energy, and the creation of new businesses and employment (European Commission 2000; 2006).

Although targets have been set for the share of renewable energy in EU member countries, no specific targets have been given for individual energy forms. Nevertheless, on the EU scale it seems that wind power is considered one of the most important forms. In 1997, the European Commission hoped to have 40,000 MW of wind power capacity installed in the EU by 2010; in 2004, the Commission believed that such a target would be exceeded, with possibly as much as 75,000 MW installed (European Commission 2004).

In Finland, renewable electricity production is mainly from hydropower and biomass, and wind power lags far behind. In the EU, on the other hand, biomass electricity is growing slowly, but the 2003 wind power capacity could produce some 2.4% of electricity consumption. However, wind power capacity is not distributed evenly among the EU countries, instead, 84% of the total

EU capacity was in Germany, Spain, and Denmark (European Commission 2004).

The EU has had a number of research programmes benefiting wind power research, such as ALTENER (1993-1997), ALTENER II (1998-2002), and JOULE-THERMIE (1995-1998). The first two were specifically about renewable energy forms, whereas JOULE-THERMIE was a non-nuclear research, development and demonstration programme. In the sixth research framework programme (2002-2006), energy issues were tied with research of sustainable development, global change, and ecosystems.

Possibly the most important EU directive regarding renewable energy is no. 2001/77/EC, the EU Directive on the Promotion of Electricity Produced from Renewable Energy Sources. This document required that the origin of electricity produced from renewable energy sources be guaranteed. In addition, national indicative targets for shares of renewable energy in electricity production were set for the year 2010. The target was 31.5% for Finland, while the EU total is 22%. In 1997, the corresponding shares were 24.7% and 13.9% respectively.

In 2007, new binding target of a 20% share of renewable energies in overall EU energy consumption by 2020 was established. What this means for individual Member States was not yet decided (Council of the European Union 2007).

Another directive (EU directive 2003/54/EC), is also important for wind power, especially for the so-called green electricity market. The Directive regulates the way electricity suppliers must divulge to the consumer the contribution of each energy source to the overall fuel mix of the supplier, and provide information about the environmental impact of the supply. This caused changes in Finnish electricity bills, for example. The Directive further regulates the way electricity production plants are to be connected to the system, although this mandate did not change the existing Finnish regulation very much.

Directive 2003/54/EC reflects the wish to open the electricity market to competition. Liberalisation and deregulation of the electricity market, which are being carried out in many European countries, are considered important in the EU. For example, the opening of the electricity market is called for in the so-called Kok report. The report was commissioned by the European Commission to identify measures through which the so-called Lisbon objectives – competitiveness and sustainable economic growth, employment, social cohesion and respect for the environment – could be achieved. In the report, the opening of the market is assumed to improve innovation and efficiency as well as to drive down prices and increase consumer choice (Kok 2004).

In spite of the above-mentioned directives and the strong will existing within the EU to promote renewable energy, energy policy remains largely in the hands of national governments. Harmonisation of energy policies has proved to be very difficult and the adoption of new policies seems to rely on national actors. In addition, there is disagreement over which renewable

electricity policy would be the best, in particular, whether the feed-in tariffs or quota regulations should be used (Tews 2005). Neither of these systems is in use in Finland.

### 5.3.2 Targets

A national wind power target was first announced in Finland in 1993, in the *Programme for the promotion of wind power production* (MTI 1993a). The target was set at 100 MW by the year 2005. This target was not met (Fig. 6).

Although the growth of capacity was not very fast during the 1990s, a new target of 500 MW by 2010 was set in 1999 in the *Action plan for renewable energy sources* (MTI 1999a). It is possible that the working group drafting the Action plan was inspired by the rapid growth in the years 1998-1999 (see Figure 6). The 500 MW target was renewed when the Action plan was updated (MTI 2003). At the same time, an estimate of development possibilities or a “vision” of 2,000 MW was expressed for the year 2025, although the working group did not set a formal target. According to these plans, wind power is expected to produce approximately 1% of the electricity consumed in Finland in 2010 and 4.8% in 2025.

### 5.3.3 Policy instruments related to the energy markets

As noted, in this study I focus on market-related policies<sup>5</sup>. Finnish policies consist mainly of research funding, subsidies, and information policies.

In recent years, the approach in environmental policy has partly shifted from strict control to a new “governmentality” in which “lighter”, more voluntary practices have been sought (e.g., Sairinen 2000; Jordan *et al.* 2003). Voluntary practices have been used in Finnish wind power policy. For example, the Ministry of Trade and Industry tried to make voluntary agreements with electricity producers regarding wind power in 1994 (Kääriäinen 1994). Voluntary agreements were also mentioned in the *Action plan for renewable energy sources* and its update (MTI 1999a; 2003), but I have not found references to successful negotiations.

Nevertheless, wind power is largely promoted in Finland through incentives and other means based on actors’ voluntary action, such as subsidies and information guidance, instead of through binding regulations

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<sup>5</sup> Other Finnish wind power policies include land-use planning, building permit regulations, and collecting data on wind conditions. Recently, much attention has been given to the so-called wind atlas. The atlas was published in 1991, but its usefulness is very limited today, because the wind speed measurements were not made with as high towers in mind as the megawatt-class turbines have. Although the need for a new atlas was acknowledged for some time (e.g., Pekkarinen 2005a), no definite decisions had been made to correct the situation before spring 2007 when the new government promised in its Government Programme (Government 2007: 40) that a new wind atlas would be compiled by the end of the year 2009.

such as a wind electricity quota. This seems to represent Finnish energy policy style, since the Ministry of Trade and Industry – in charge of energy policy – has been found to favour deregulation (Sairinen 2000: 259; Sairinen 2003). Of the fifteen European Union member states reviewed by del Río and Gual (2004), only Finland and Ireland did not have any feed-in or tradable green certificate scheme for wind power. Even Ireland had a tendering scheme in use and has since moved to a feed-in type support system (Department of Communications... 2006).

#### 5.3.3.1 Research, development and demonstration funding

Several governmental research and development (R&D) programmes supporting wind power development have been carried out in Finland. The general aim of the R&D funding, in terms of energy markets, is to lower the price of the wind power technology and thereby help its diffusion.

The programmes have been funded by Tekes (Finnish Funding Agency for Technology and Innovation), which operates under the supervision of the Ministry of Trade and Industry. The most significant programmes were NEMO (1988-1992), and NEMO 2 (1993-1998), but also the programmes CLIMTECH (1999-2002), DENSY (2003-2007), and CLIMBUS (2004-2008) have contributed to wind power research.

NEMO (New energy systems and technologies) and NEMO 2 (Advanced energy systems and technologies) were about renewable energy sources, particularly wind and solar energy, although the emphasis was on the systems and technologies being “advanced and new”. The aim was both to develop Finnish technology and industry and to increase the use of such technologies in Finland. The first programme had a budget of 70 million FIM (12 million euros), of which 11.8 million FIM (1.98 million euros) to wind power (Mika Anttonen [MTI], personal communication, 28 February 2006). The second programme had funds for 130 million FIM (22 million euros) (MTI 1993b; Tekes 1998).

CLIMTECH (Technology and Climate Change Programme) had a broader field, so that only one of the six main subject areas was about renewable energy sources. The programme was aimed less at specific technological innovations and more at investigating the “development needs and possibilities of the technologies”, such as understanding issues related to commercialisation, creating or testing energy service concepts, creating road-maps and estimating the potential of energy technologies (Soimakallio and Savolainen 2002: 1). The governmental funding for this programme was about four million euros.

DENSY (Distributed energy systems technology programme) is an ongoing programme. The budget is some 50 million euros. This programme is not limited to renewable energy forms (<http://www.tekes.fi/densy/>).

CLIMBUS (Business Opportunities in Mitigating Climate Change) is estimated to have a budget of over 70 million euros, but very few of the

projects announced by June 2007 were connected with wind power (<http://www.tekes.fi/climbus/>).

### 5.3.3.2 Subsidies

Investment subsidies are one of the two important wind power subsidies used in Finland. The subsidy can be up to 40% of the investment costs for wind power. The grants have varied over the years (Table 2). The figures in Table 2 are grants instead of payments. Grants are paid only when the project is realised, which may happen in a different year from the time the grant is awarded. Few projects have been dissolved entirely, but in February 2006, grants had been approved for projects totalling about 6 MW that had not yet been realised (Mika Anttonen [MTI], personal communication, 28 February 2006).

**Table 2.** Subsidies granted to wind power projects in Finland, 1995-2005. Source: Mika Anttonen (MTI), personal communication, 28 February 2006.

Year	Million euros	Average Subsidy Percentage of Total Costs
1995	0.85	na
1996	0.50	na
1997	1.35	na
1998	5.05	34
1999	2.35	32
2000	1.35	33
2001	1.85	35
2002	7.3	35
2003	4.8	35
2004	4.3	37
2005	0	
<b>total</b>	<b>29.7</b>	

The variations from year to year largely reflect the varying activity of wind electricity companies: the funds available have not changed much, but only a relatively small number of applications are presented to the Ministry of Trade and Industry yearly. However, as the funds available for supporting wind power are decided annually in budget negotiations, future policies and funds are always uncertain<sup>6</sup>.

<sup>6</sup> This is demonstrated poignantly in the case of a large demonstration subsidy (e.g., 15-20 million euros). Such a subsidy is planned to be available every few years for one large demonstration project, such as the first Finnish offshore park. The subsidy has been discussed since 1999 (MTI, 1999a), but despite the plans and the efforts of the Ministers and

A second form of subsidies is based on production. From 1990 to 1997 there was a Finnish carbon tax on fuels used in electricity production. This naturally gave the non-carbon energy forms an advantage. The tax was the first carbon-based tax in the world, and its formation can be considered the starting point and cornerstone of Finnish environmental taxation (Vehmas 2002: 87-93; Tikkanen 2006: 75).

The tax system was renewed in 1997, however, when the carbon tax was removed from fuels used in electricity production, and all electricity consumption was subjected to a tax<sup>7</sup>. To compensate for the change, renewable electricity has been supported by directing (at least a part of) the tax, paid by the consumers, to the renewable electricity producer. For wind power this subsidy has been ~0.7 c/kWh. The tax refund is relatively expensive for the state, but the share of wind power in the total expense is small, less than 2% in 1999-2002. The majority of the support is used for biofuels. In investment subsidy the share of wind power is much higher (16% in 2003), but considering investment and tax subsidies together, the share of wind power was some 14% of the total subsidies given to renewable energy in 2002 (SAO 2003; Leino *et al.* 2004, 8).

#### 5.3.3.3 Information policies

As wind power is a new, decentralised source of electricity, electricity producers may be unfamiliar with rules and regulations concerning it. Also, as a small-scale solution, wind power can encourage new actors to enter electricity production. To help in such situations, at least one guidebook for wind power projects has been published in Finland (Motiva 1999). It was published by the government-owned Motiva which promotes renewable energy sources and efficient energy use.

Electricity market liberalisation has made it possible for household consumers to change their electricity supplier. However, Finns have not taken advantage of this as much as was hoped for. Between 1998 and 2002, only some 22% of households renegotiated their electricity contract (EMA 2003)<sup>8</sup>. Enthusiasm for green electricity has been even smaller. There is no governmental green electricity label, but since the implementation of the EU Directive on the Promotion of Electricity Produced from Renewable Energy Sources (2001/77/EC), all Finnish companies have had to disclose the source of their electricity to consumers.

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the Ministry of Trade and Industry, this subsidy has never been included in the state budget.

<sup>7</sup> For a review of this process and reasons for it, see Sairinen (2000: 189-202) and Vehmas (2002: 107-124).

<sup>8</sup> Certain factors reduce consumer choice. A few smaller electricity companies have refused to sell electricity outside of their supply area, and some apartment buildings make the decision regarding electricity supplier jointly, limiting individual households' freedom of choice. While relevant, these factors do not change the fact that relatively few Finnish households exercise their possibility to change suppliers or to ask for bids from various suppliers.



In addition, since 1998, the Finnish Association for Nature Conservation (FANC) has used a label for renewable electricity production that meets its environmental criteria. Although statistical information of the total number of green electricity customers in Finland does not exist, in the beginning of 2004, only 0.2% of household customers were purchasing electricity under this, the most widespread, green certification (FANC 2005a; Statistics Finland 2001). However, by the end of the year 2004, the number of households buying such electricity rose from about 4,000 to over 200,000. This resulted from a large electricity producer company *Fortum's* decision to sell only labelled hydropower to all their household customers, rather than from any remarkable increase in green electricity production or voluntary green electricity purchases (FANC 2005b).

In order to make it easier for consumers to compare electricity products and prices, the Finnish Energy Market Authority started an internet-based service in February 2006, at the address <[www.sahkonhinta.fi](http://www.sahkonhinta.fi)>. This service also allows the search for renewable electricity products separately.

### **5.4 Finnish wind power actors**

In this section I describe those actors who influence wind power policy and wind power development in Finland. Some of them are part of the wind production sector, for others, like government Ministries, wind power is only one of their concerns. The description does not include the relative importance or political “weight” of each group, as the power relationships between the actors were not studied. This section also includes some results from the analysis of Parliament documents.

#### **5.4.1 State actors**

Parliament, the highest decision-making authority in Finland, sets the direction of policy. Since Parliament passes legislation, decides on the state budget and supervises the government and its Ministries, Parliament has a role to play at different stages of wind power policy making. Parliament approves the state budget, in which the funds for energy subsidies are set, and all tax laws are passed by it. Parliament also approved the target of 500 MW for the year 2010. Parliamentary issues are discussed in the Committees, such as the Commerce Committee, the Environment Committee, and the Committee for the Future.

However, the impact of Parliament on the details of wind power policy is not very great, since most of the policy issues have been prepared in the Ministries; although Parliament occasionally discusses wind power issues, few changes have been introduced to the wind power policy through this body.

In the Finnish Parliament, the most active groups raising questions about wind power have been the Green League and the Swedish People's Party, but some activity has been shown by almost all parties (of which there are currently eight represented in Parliament). Often the same individuals return to wind power issues repeatedly, while their party members remain passive. The material used in this study does not reveal the kind of close connection between any single party and wind power such as there has been between the Finnish Centre Party and peat or between the National Coalition Party and nuclear power (Ruostetsaari 1998: 163-164).

Between the years 1993 and 2005, the number of written and oral questions by Members of Parliament relating to wind power increased slightly (both in absolute numbers and as a share of all questions expressed in a year), but wind power related questions still represent less than 0.3% of the questions presented yearly.

Usually, increased support for wind power was requested in Parliamentary oral and written questions, but in one written question (Askö-Seljavaara and Saarikangas 2005), doubt was expressed about the appropriateness of wind power regulations for siting and building permits. In that question, wind power was criticised mainly because of its impact on the landscape, but also because it was seen to be a financially unfeasible energy form.

The purpose of the questions is not necessarily to obtain information from the Ministers, but rather, for example, to pressure a Minister to action, to demonstrate the need for change and make the administration more responsive to Parliament, to increase the publicity an issue receives or to demonstrate the interest the Member of Parliament has towards an issue (Wiberg and Koura 1998: 207-213). It is therefore not easy to assess how much impact the Members of Parliament and their questions have had, but it can be assumed that the questions' main relevance is in keeping the topic active in the Ministries and in the minds of the relevant Ministers, strengthening the political mandate to support wind power. There have also been a number of motions by Members of Parliament for a larger use of budget funds for renewable energy support, but these have rarely been successful.

Although interest in wind power does not strictly follow political party lines, recent Ministers of Trade and Industry have not been from the most active parties. In Finland, the Ministry of Trade and Industry (MTI) is central in energy policy making, although other Ministries also have a role in wind power policy. The Ministry of Finance (MF) has an important role, since much of the Finnish wind power policy is in the form of financial incentives. The MF drafts the annual state budget and is consulted in energy tax and other financial policy matters. The Ministry of the Environment (ME) has a dual role in wind power policy. The ME participates in climate policy, of which wind power policy represents one aspect. In addition, the ME has the responsibility for directing land use planning procedures, although the plans are mainly done at local or regional levels.

Another governmental actor is *Tekes*, the main public financing organisation for R&D in Finland, operating under the guidance of the MTI. In 1999, Tekes changed its official English name from *Technology Development Centre* to *National Technology Agency* and, in 2006, to *Finnish Funding Agency for Technology and Innovation*.

In Finland, many policy making processes begin in a working group where different interests and types of expertise are represented. In fact, as reported by Sairinen and Lindholm (2004), the Finnish environmental policy style has been rather consensual when it has concerned pollution control. Policy is often drafted in broad-based committees or working groups. The *Action plan for renewable energy sources* (MTI 1999a), and the *Action plan for renewable energy 2003-2006* (MTI 2003) were products of such groups. Many of the actors that are described in this section were represented, such as Ministries, *Tekes*, and various lobbying organisations.

### 5.4.2 Electricity producers

Several companies are involved in wind power development in Finland. First, there are the producers of wind electricity. Finland has a large number of utilities, many of them relatively small and municipality-owned. Globally, wind power has often been built or owned by actors who have not previously been active in energy production (although recently, Germany and other countries have created policy systems that allow utilities to benefit from wind power production). In Finland, however, this type of broadening of the producers' field has been rare. Wind power plants have mostly been installed by existing energy producers for which wind power is only one of their energy forms.

An exception to the rule is *Lumituuli*, the first Finnish nation-wide, customer-owned producer of wind electricity. Owners are private citizens, companies, societies, and the community of Lumijoki (located on the coast of the Bothnian Bay). The owners have an option to buy 500 kWh of wind electricity per share per year. The idea of utilising wind power at Lumijoki was born among the local people and realised through co-operation with an environmental non-governmental organisation (NGO) called Dodo. There have been no specific policies to encourage individual or co-operative ownership in Finland. Such ownership is most common in the semi-autonomous Åland region. The wind power capacity on Åland Islands is less than 10% of the Finnish capacity.

Some of the utilities that have constructed wind power have done it outside of their supply area. For example, nine municipality-owned utilities founded a company called *Hyötytuuli*. The company operates in Pori on the west coast of Finland, but many of its owner companies are located on the south coast or inland. It is a non-profit company that sells all the wind electricity it produces at cost to the owner companies in relation to the shares they hold (this system, referred to as the Mankala Principle, is common in

the Finnish energy production field, particularly in the case of very large energy investments). In this way the utilities were able to pool their resources to invest in a product with which they were previously unfamiliar. Leino *et al.* (2004: 10) have even stated that since it is not possible to expect profit from capital used in wind power construction in the present market, using the Mankala Principle is necessary for wind power construction in Finland. Although it seems that at least larger energy companies should be able to bear the risks of the small-scale projects that are typical of Finland, the Mankala Principle has also allowed the pooling of human resources. Many Finnish companies have little experience in the planning and operation of wind power projects, and this system allows them to “outsource” the projects to a company specialising in wind power.

### 5.4.3 The turbine industry

Similar to the wind electricity companies, the Finnish wind power turbine industry companies include large companies for whom wind power is only one interest as well as companies that are specific to wind power. In many cases the production has started from something very different and then been extended to wind turbine components. For example, one company made gears for ships, paper mills, etc., and then started making them also for wind turbines. Similar experiences have occurred in Denmark, where many turbine manufacturers started out as manufacturers of agricultural machinery.

The industry includes component manufacturers with their subcontractors. The following company names are only some examples. Finnish production of whole turbines (*Winwind*) started in 2001; previously, components were supplied to foreign turbine manufacturers. Components include, for example, glass fibres (*Ahlström*), steel products and towers (*Rautaruukki*, *Toivalan konepaja*), wind measuring systems (*Vaisala*), generators (*ABB*), and drives (*Moventas*, formerly *Metso Drives*). Additional companies include consultants and project developers (*Elektrowatt-Ekono*), construction contractors, and operation and maintenance services (Antila *et al.* 2005a).

### 5.4.4 Organisations

Several organisations, or lobbying groups, are active in wind power development. Again, some of these are specific to wind power; in others wind power makes up only a small part of their activities. The organisations' perspectives can also vary, with some organisations openly promoting wind power, while others have doubts about wind power's suitability in Finland.

In 2002, the wind turbine industry organised itself as *Tuulivoima-alan toimittajat* (Wind power field's suppliers, part of Technology Industries of

Finland). Co-operation with the Finnish Wind Power Association and the wind power group of Finergy (*Energiateollisuus* since 2004, see below) has been close.

*Suomen Tuulivoimayhdistys* (the Finnish Wind Power Association, FWPA) was founded in 1988 to promote wind power in Finland, both for large scale use and through some members' own, self-constructed turbines. The association publishes *Tuulensilmä* (The Eye of the Wind) magazine, which together with the association's e-mail list works as a national information channel for wind power in general. FWPA co-operates with VTT Energy and Finnish Meteorological Institute in producing Finnish wind energy statistics (*Tuulivoimayhdistys* 2006). FWPA includes many companies as its members.

FWPA has a Swedish-speaking sister organisation *Vindkraftföreningen* (the Finnish Wind Energy Association), founded in 1980. It concentrates on spreading information on wind power and promoting it in Finland. *Vindkraftföreningen* has remained smaller than the Finnish-speaking association.

The close co-operation with industry, and the fact that many companies are members of the FWPA, has raised some questions about the FWPA's role. Some members have complained that the industry has "taken over" the organisation. On the other hand, some interviewees saw the FWPA primarily as an ideological organisation, while still others considered it a neutral expert organisation. Clearly, there is disagreement about the organisation's character, although its general purpose as a promoter of wind power is approved of. The Swedish-speaking *Vindkraftföreningen* was seen much more uniformly as an ideological organisation.

At the time of the interviews, no clear opposing group to wind power existed, but in the summer of 2005 one emerged. Large newspaper advertisements announced internet pages at the address <[www.totuustuulivoimasta.com](http://www.totuustuulivoimasta.com)> where wind power installations were criticised. *Totuus tuulivoimasta* ("Truth about wind power") was a group of coastal organisations. Their criticism focused on the practices of siting and on the selection of sites where wind power plants have been (or are planned to be) erected. The latter were criticised for landscape and nature conservation reasons.

In the working group that produced the *Action plan for renewable energy sources* (MTI 1999a), the interests of the economic sector were represented by *Teollisuus ja työnantajat* (the Confederation of Finnish Industry and Employers), which later merged with the Employers' Confederation of Service Industries (PT) to form *Elinkeinoelämän keskusliitto EK* (the Confederation of Finnish Industries EK). This new confederation represents the entire private sector, both industry and services, and companies of all sizes, and promotes the interests and competitiveness of its member companies. The objectives of *Teollisuus ja työnantajat* were essentially the same, but it did not represent service industries.

Operating within *Energiateollisuus* (the Association of Finnish Energy Industries ET) is a specific wind power group, which was mentioned previously. ET is an industrial policy and labour market policy association, which was founded in the autumn of 2004 by companies operating in the energy sector. One of the organisations that merged into ET was the Finnish Energy Industries Federation FINERGY, which participated in the working groups for the *Action plan for renewable energy sources* (MTI 1999a) and the *Action plan for renewable energy 2003-2006* (MTI 2003).

The environmental point of view was represented in these working groups by a non-governmental environmental organisation *Suomen luonnonsuojeluliitto* (the Finnish Association for Nature Conservation, FANC). FANC was founded in 1938 and it is the largest environmental NGO in Finland. It is often seen as an established, even relatively conservative environmental NGO, and is habitually called into working groups that discuss various environmentally important issues. This organisation also has a Swedish-speaking sister organisation, *Natur och Miljö* (the Finnish Society for Nature and Environment). The two organisations have similar objectives and they work closely together.

### 5.4.5 Researchers

Another group that deserves a mention here is researchers. Technological development has been very important for the growth of wind power capacity. A Finnish specialty in technological R&D has been arctic innovations, such as heating of blades to deter icing. Other important areas of research have included wind measurements and the integration of wind electricity into grids. Some important technical issues still remain to be solved, such as the impact of sea ice on offshore turbines. Increasing competition in the turbine market, resulting from new companies and countries entering the market, means that R&D remains crucial for the industry.

In addition, wind power plans and programmes rely on educated views about future development. Expertise is highly valued in Finnish energy policy making (e.g., Paldanius 1992; Ruostetsaari 1998). For example, Ministries commission background studies from research institutions, and experts are often invited to express their views and share their expertise with different Parliament committees. These factors enhance the role of researchers in wind power sector development.

### 5.4.6 Consumers

One group that has the potential to affect wind power development was not included in the list of interviewees, namely, electricity consumers. The reason was that their role in the wind power debate was expected to be marginal. Consumer organisations, for example, seem to be more interested

in the price of electricity than in its environmental quality. However, consumers have a chance to influence wind power development through their purchases of electricity, although Finnish household consumers have not been particularly active in this regard. In addition, consumers influence wind power policy and wind power development indirectly, because their behaviour and other actors' assumptions about such behaviour influence policy choices and investment decisions.

I studied the wind power actors' perceptions and their interpretations of consumer behaviour. In addition, the views of consumers themselves were researched by M.Sc. Suvi Salmela. These two perspectives were combined into a study about consumers' role in the green electricity market (III).

The interviewees represented all the groups mentioned above except consumers (see Appendix 1). However, as discussed in Chapter 3, the interviewees' answers are not linked to their organisations in the analysis. The actors "move" in the field, and they cannot be classified on the basis of their organisations. There is no clear internal unity among the representatives of such groups as "state actors" or "organisations". On the other hand, very similar views can be found among representatives of different groups.

## 6 Wind power actors' views

In this chapter I report on the findings of the discourse analysis and summarise the findings from the three journal articles published before (I–III). First, I will analyse wind power discourses that demonstrate how wind power is understood as an electricity production form and an industry in Finland. Second, scenarios based on the interviewees' views about wind power development until the year 2025 are presented. Third, I will discuss wind power actors' views on ways to promote wind power in Finland. The criteria the wind power actors use when considering the merits and shortcomings of energy policy instruments are examined. The role they see consumers having in increasing wind power production in Finland is also discussed.

### 6.1 What is “wind power” in Finland? Analysis of discourses

Coming from the field of environmental protection science, I considered wind power a way to produce electricity from a renewable source and in an environmentally friendly way. Naively, I thought that it was the same for everyone else. As I studied the issue more, I began to understand my mistake. Particularly illuminating were the interviews: “*This is not about environmental issues, this is a real industrial activity*” observed one interviewee when discussing his motives for working with wind power.

Wind power is not only electricity production but also the industry of manufacturing turbines. The latter sector employed some 2,000 people in Finland (Antila *et al.* 2005b) and some 72,000 people in the EU in 2004 (European Commission 2004).

In addition, the “environmental friendliness” was not the uniformly accepted “fact” I had thought. In this section I will describe different ways of discussing and understanding wind power in Finland. I also pay attention to contextual factors that may help to explain these discourses and understandings.

#### 6.1.1 Environmental impacts

Wind turbines produce no chemical emissions during their operation, although some emissions are created during the turbines' life-cycle. Use of wind power can therefore offset emissions, particularly carbon dioxide, from the energy sector. This view is nearly uncontested in Finland. In the interviews, this environmental benefit was rarely discussed in detail but merely mentioned as a fact in passing. Only one interviewee expressed doubts about the positive impact of wind power on greenhouse gas emissions.



However, like all energy production methods, wind power also has negative environmental impacts, which present a challenge to its overall environmental friendliness. These include impacts on elements in nature, such as birds flying against the blades, as well as impacts experienced directly by humans, such as noise and changes in the landscape.

Some interviewees had doubts whether wind power is environmentally benign. Noise and birds received relatively little attention in the interviews. Landscape was given much more attention, and it was often thought to be a factor that would limit wind power capacity in Finland. Some interviewees also considered landscape impacts to be the only significant environmental drawback of wind power. Landscape or scenery as an aesthetic issue is a social construct, and therefore landscape changes differ from other possible negative impacts by affecting only human beings.

Landscape impacts may have been emphasised for many reasons. First, there is little that can be done about the effect turbines have on scenery, although painting the towers with a matt-finish, for example, may help to reduce their visibility. Second, traditional electricity production plants are single, large installations whose visual impact is limited to a relatively small area. In contrast, wind power is a dispersed form of production, and plants have to be scattered over a large area across open landscape. Third, the effect is directly observable, without need for any measurements or studies. Fourth, the negative impact is always domestic, instead of taking place abroad, so the problem has to be faced locally. Last, but not necessarily least, changes in the landscape may also have economic impacts in the form of reduced tourism or lowered real estate value (Varho 2003a).

A few interviewees clearly did not like the sight of wind turbines, although they did not say so directly. Instead, they referred to the magnitude of the impact on the landscape and the way “people” experience it.

On the other hand, some interviewees found the attention given to negative impacts unreasonable. The defence of wind power was very vocal and took many forms in “neutralising” the negative impacts. Neutralising talk employed several tools, some of which were more or less objective, some of which were emotional. Similar tools were also used to raise doubts about wind power’s overall environmental quality. Objective tools included, for example, references to experiences in other countries, to some outside authority, or to different studies. Many interviewees also referred to their own experiences and described examples. The more emotional tools were exaggerations and accusations of irrationality or subjectivity on the part of other wind power actors. The forms of the neutralising talk partly overlap, as similar arguments from different points of view were used. Despite the overlapping, four discourses (*denying, adapting, proportioning, and blaming*) could be identified.

Sometimes the existence of negative impacts was *denied*, or they were seen to be quite minor. One tool was to refer to the irrationality of the objections to wind power. The impact was also shown as unimportant by comparing it to something commonplace:

*This noise, it is not a problem any more, the noise from a wind power plant is less than what you hear sitting in the front seat of a car.*

There were reminders that the visual effect can also be positive, since some people like seeing wind turbines, and everyone was expected to get used to them or not consider them ugly once the turbines actually existed in the landscape. In this way the whole issue of turbines disturbing the landscape was questioned:

*Once the turbines are in the landscape, it is not so bad, you both get accustomed to them and you learn to consider them beautiful [...] they have made studies in Spain where people have been put in the middle of different landscapes, and the clear result was that a virgin natural landscape is not considered as beautiful as that which has human constructions in it.*

This type of talk was the most extreme, because it denied that any significant negative impacts exist. The difficulty was thought to lie in insufficient or wrong information and lack of experience with wind power, issues which would be corrected over time. This kind of argument reflects a view that Hyvärinen (1991: 111) has called “scientification of politics”: that conflicts are caused (only) by wrong or insufficient information.

Even if the negative impacts were considered real, their importance could be mitigated through a number of discourses. The first of these was *adaptation*. The negative impacts were acknowledged, but were shown to be abatable or avoidable, often through careful land-use planning. The importance of the attitudes of wind power developers and the local people was also emphasised. These actors may wish to avoid unnecessary damage to nature or obstacles to wind power development, or they can be confrontational and negative from the outset.

Another discourse, *proportioning*, compared the positive and negative environmental impacts, raising questions about their relative importance. Sometimes it was environmental groups and authorities who were seen to be incapable of understanding the relative significance of different environmental issues.

*These environmental criteria that I personally think are of secondary importance are allowed to rule [...] the use of sites is stopped because the turbines seem ugly or they disturb the landscape, or they can even cause some noise, things which are rather marginal problems in this total environment of ours.*

It was also thought that these comparisons and information about the positive aspects of wind power would help to make wind power more acceptable. The assumption was reasonable, as the value given to the impact on the landscape was considered to be highly subjective and to depend in part on environmental attitudes.

The negative impacts of wind power were also compared with its competitors:

*There is a coal power plant, a pile of coal and a big power plant in the middle of Helsinki, and you can ask how nice an aesthetic construction it is, in the middle of the city, versus having a wind farm maybe some five kilometres away.*

Another way to neutralise negative environmental impacts was to *shift the blame* from wind power to people. Resistance to wind power is then constructed as selfish, ignorant, or irrational. Selfishness was demonstrated in the “nimby” thinking (“not-in-my-backyard”). The theme was strengthened by a “yimby” argument, i.e., some interviewees’ statements that they would not mind seeing turbines in their own landscape.

The image of irrationality can be connected to the proportioning discourse. The main difference between these discourses was attitude: proportioning was expressed in more neutral, objective terms, while blaming was more emotional and critical in tone.

Bell *et al.* (2005) have suggested three explanations for the “social gap” between the high level of public support for wind power and the low success rate of wind power planning applications in the UK. Although the perspective of Bell *et al.* is that of the “people” while I consider the discourses of Finnish wind power actors, reflections of Bell’s and his colleagues’ explanations are observable in these discourses. The denying discourse included the view that most people support wind energy developments, and only a very small but active minority oppose and stop such developments. This view was called a “democratic deficit” by Bell *et al.* (2005). Comparison of environmental concerns, in the proportioning discourse, relates to the “qualified support” concept, and the “nimby” thinking of the blaming discourse, to the “self interest” explanation. Clearly, these themes and views relating to environmental impact are not unique to Finland.

In the interviews, there were also appeals to an overriding necessity. Neutralising environmental impacts in this way is common in energy-policy discussions in Finland. For example, Pekonen (1991) and Kantola *et al.* (1993) have described how the growth of electricity consumption has been constructed as being inevitable, and the need for reasonably priced electricity portrayed as necessary for international competitiveness. Usually these arguments are used to explain that environmentally superior but more expensive alternatives are impossible to implement. With wind power, this type of argument emerges as a necessity to slow climate change, an environmental instead of an economic requirement. Sometimes the necessity was presented as a moral obligation, sometimes as a formal demand by the Kyoto Protocol to the United Nations Framework Convention on Climate Change (United Nations 1998). Similar arguments were used successfully to promote nuclear power in Finland in 2002, as described by Kyllönen (2004).

The interviews contained a great deal of the neutralising talk described above, probably partly a result of local wind power project conflicts and of

newspaper and magazine articles, where the landscape impacts of wind power had been criticised (e.g., Niskasaari 2002).

Overall, however, wind power still seems to have a positive environmental image because of its nearly uncontested environmental benefits. The discussion of environmental status has probably more importance to the business sector and for decision-making at the local level<sup>9</sup>. For national energy policy makers, it is the environmental benefits that are most important.

However, wind power's environmental benefits can only be realised if wind power capacity is taken into use and offsets emissions from other, more polluting energy production forms. The view of wind electricity in relation to the whole electricity system in Finland is very multifaceted, as will be discussed next.

### 6.1.2 Wind electricity in relation to the electricity system

Wind power was sometimes *marginalised* in the interviews, i.e., presented as having a very insignificant role in the energy sector. First, it was argued that the potential for wind power in Finland is small because of a limited supply of suitable areas for construction (wind conditions, other land-use pressures on lands suitable for wind power production, unacceptable impacts on scenery, etc.). Second, wind power was said to have high costs, which reduce its competitiveness and necessitate state subsidies over a long time period. Third, direct comparisons were made to other sources of energy, particularly the "large" electricity production forms, such as nuclear power and fossil fuels. The energy-intensive Finnish industry and Finland's dark, cold winters increase the demand for ample, continuous supply. It was assumed that only big power plants could provide the base-load supply that is always needed.

*You cannot run paper mills with this [wind power], even though you can produce the electricity for a private citizen and a community. That consumption requirement is so much smaller that we talk about totally different dimensions there.*

Comparisons were also made to other renewable energy sources, in particular to biomass, which is already used rather extensively in Finland and is thought to have high potential for growth. Through these arguments, wind power was constructed as an unimportant element of the energy sector, something that is nice to have in the energy palette, but only in a marginal role.

The *defence* of wind power seemed to be a direct response to the marginalising discourse. The arguments served to re-establish the relevance

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<sup>9</sup> However, local conflicts regarding siting of wind power plants have also appeared in the national media (e.g., the television programme MOT, 26 September 2005 at 8 PM, Finnish Broadcasting Company, Channel 1). Such programmes may affect general public perception of wind power.

and significance of wind power in energy production. The potential and need for wind power were defended by meeting each marginalising argument with a counter-argument. For example, the possibility of building offshore wind farms was emphasised to counter the argument about limited wind resources on land, and the mechanisms that are expected to reduce wind power's costs were discussed. The need for wind power was established by pointing out that all renewable energy forms will be needed in the future. It was also stressed that it is possible to have considerably more wind power than the 0.1% share of electricity consumption at the time of the interviews, even if wind power will never be the primary source of electricity in Finland.

The discussion of significance is crucial in estimating the environmental status of wind power, since marginal wind power cannot have a meaningful role in reaching the environmental targets of the energy sector. Even though discussion of impacts tends to lean towards accepting wind power as an environmentally sound choice, it becomes questionable whether wind power can ever amount to much in reducing emissions from energy production in Finland.

Another discourse struggle about wind power concerned its status or nature as a form of electricity production. This question differed from the previous argument because there were no directly opposing views. Instead, the views could be – and often were – used by the same people and may have similar consequences. Nevertheless, the opinions appeared very different from one another.

In the *normalising* discourse, wind power was seen as business as usual. It was emphasised that, although the environmental impact of various production processes may be different, the end product, electricity, is the same. In business terms there is no difference: It is electricity that is produced, managed, and marketed.

Normalising diminishes the attention given to the environmental status of wind power and can have two very different effects: it can reduce the importance of wind power, for if wind power is nothing special, there is less reason to build or support it. It can also help to create an impression of wind power as a normal business instead of solely an environmental activity, making it more acceptable to investors.

There was also a *differentiating* way of talking about wind power, as something different from conventional energy forms. Differentiating discourse contained several elements, and not all of them were shared by all who used it.

One element was that wind power was not seen as a normal business, but requiring subsidization. It was also considered a “troublemaker” in the electricity market, because changes in windiness cause fluctuation in production, making it more difficult to control electricity in the grids and in the market.

Sometimes wind power was presented in the interviews as not really competing with conventional energy forms. This view emerged in particular when discussing nuclear power. Wind power and nuclear power were seen as

based in different motives, and therefore investment in one does not hinder investment in the other:

*Q: Does this nuclear power decision affect the wind power market in Finland?*

*A: No. They do not compete in the same market, well, of course, all are in the same electricity market, but this is a question of a very different kind of product. Nuclear power is base-load power, and base-load power is suited for running long, steady loads. Wind power is what it is, comes-when-it-comes power.*

The electricity market is the same for all products, but in this discourse it was usually assumed that wind electricity would be more expensive than conventional electricity and would be bought only for environmental reasons, which would limit the number of customers.

### 6.1.3 The conflict of environmental issues with the energy business

The discourses described above reveal the complexity of wind power's image within the energy sector. Next I will discuss certain factors that may influence the discourses, namely, the conflict between environmental issues and the energy business, and the struggle between different forms of energy production (Section 6.1.4).

In the deregulated market it is the energy companies that have to make investment decisions. In many interviews the government was seen to have power only to make wind power a more attractive prospect for investors. Such a viewpoint gives great importance to the views of the private sector. In fact, advocates of wind power try to convince decision makers both in politics and in private energy companies of the merits of wind power. Actually, people working for the Finnish energy sector and energy policy – whether in the public or the private domain – often have rather similar views about the sector and its needs. They also often have similar educational backgrounds and sometimes have worked within both the private and public sectors.

The energy sector has a long history of conflict with environmental issues. Probably all recent energy production plants have been criticised on environmental grounds, and energy production and consumption in general have been blamed for all kinds of ills, including climate change, radioactive pollution, and loss of habitats. National and international environmental organisations tend to favour wind power, whereas local organisations may oppose particular projects, although recently national “umbrella” anti-wind organisations have also emerged, as reported by Szarka (2004). The mixed message from environmental organisations perpetuates the old hostility and suspicion.

One interviewee summed up this attitude:

*If you think of decision-makers and industry, then perhaps nature and environmental organisations have a bit of a bad image [...] if you look at the European Wind Energy Association, it looks more like a pin-stripe firm, which is, of course, more likely to have influence.*

Wind power enthusiasts risk being labelled unprofessional “believers” if they are suspected of working primarily for environmental reasons. Some interviewees saw ideological motivation, particularly when it concerned environmental issues, as a threat to the reliability of information. Ideological explanations can, of course, sometimes be a threat to valid environmental science and effective policy, as discussed e.g., by Haila (2001: 266-272). The suspicion of environmental issues went deeper than that, however. Environmental issues were seen to be far removed from industrial and commercial interests. According to this view, business operates in the “real” world, but environmental issues in themselves are always at least somewhat ideological.

In fact, based on the analysis of the discourses, it seems almost as if the promoters of wind power were purposefully trying to erase those aspects that make wind power special and that legitimate wind power policy. Such an attitude may have been particularly important around the time I conducted most of the interviews. During the winter and spring of 2002 there was a very heated debate about building a new nuclear power plant in Finland. The debate culminated in a vote in Parliament in May 2002, when a private company received the crucial political permission to build Finland’s fifth nuclear reactor.

#### **6.1.4. Struggle between energy forms**

The debate about additional nuclear power has dominated discussions about Finland’s energy future for a long time. During the recent debates concerning the fifth nuclear power plant, those who opposed nuclear power on environmental grounds often brought up wind power and other renewable energy sources as an alternative to nuclear power. For the wind power lobby, it may have been necessary to assure that wind power is not in conflict with nuclear power. This perspective would explain the differentiating discourse that set wind power apart from nuclear power. It created an image of wind power as non-threatening and not competing with the new nuclear reactor and could actually serve the same function as the normalising discourse, which presents wind power as something normal and ordinary, similar to the other electricity production forms.

On the other hand, if the environmentally benign nature of wind energy had been emphasised, it might have created an impression that the wind energy sector openly opposes the nuclear energy faction. In fact, the Finnish Wind Power Association did not take any stand regarding nuclear power. The chairman of another renewable energy organisation, Finbio (Bioenergy

Association of Finland) stated that there is no conflict between renewable energy and nuclear power, which is “base-load power”. He even said that securing base-load power would advance the use of bioenergy (Nurmi 2002). Lammi (2004: 26) attributes the opinions of these renewable energy organisations to the fact that both organisations have member companies that were behind the application for the nuclear plant.

Some interviewees saw the marginalising discourse as a symptom of nuclear lobbying. They hoped that once the decision was made in Parliament, the situation would return to normal, and they would not have constantly to defend wind power against marginalisation by the nuclear faction. Unfortunately for them, lobbying for the *sixth* nuclear reactor has already started, and negative statements about wind power have been expressed (e.g., Asko-Seljavaara *et al.* 2004; Rantanen 2005).

Marginalisation and defence can be symptoms of a battle between old energy structures and a new challenger. Existing producers and representatives of conventional energy forms may see wind power as a threat. Wind power not only represents a new energy production form, but it may also allow the introduction of new players to the field, since wind electricity is produced in relatively small, dispersed plants, which may be owned by small companies, co-operatives, etc.<sup>10</sup> Marginalisation of the challenger can be a way of defending old structures.

Some recent calculations show that wind power could push other producers out of the market if enough wind power capacity were taken into use (Kiviluoma and Holttinen 2006). So far, however, there is little evidence that the energy market actors would share such a view. Instead, the opposite seems to be the case: Some interviewees saw the energy sector as quite conservative and feared that promoting wind power – a new, small-scale, and renewable solution – could endanger their personal credibility. There is a risk of being associated with insignificant puttering. Seen in that light, the marginalising discourse probably reflects the true opinions of many energy sector actors. There probably exists a genuine belief that wind power cannot constitute either a true promise or a real threat in the energy sector.

Making wind power look non-threatening may thus have been a sound strategy, since wind power is a small field and seems to need the acceptance

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<sup>10</sup> In the beginning of my study I thought that wind power might cause a change in electricity production company structures. An example of a new kind of company existed, namely *Lumituuli* at Lumijoki. The idea to utilise wind power at Lumijoki was born among the local people, and after the scheme's initial failure, due to too small demand for shares of the company in the area, an environmental organisation called Dodo picked up the idea. After the liberalisation of the electricity market, nation-wide marketing of wind power was made possible. Shares were sold nationally, and shareholders are allowed to buy 500kWh of electricity per share per year from Lumituuli. Any surplus of electricity can be sold to Kainuun sähkö, an established electricity company, which also has the responsibility for the electricity distribution (Lumituuli 2001). I believed that this combination of local initiative, a NGO, and an “ordinary” electricity company could signify a change to more versatile company forms in the energy sector, but it has remained the only company of a new type. On the other hand, the objective of the actors was also to activate “ordinary” electricity companies to build wind power, which it may have done (Palmroth 2004: 44, 69-70).



of existing political and economic powers. However, while such may have been a strategy, it is probably also the way many in the wind power sector perceive the issue.

### 6.1.5 The turbine industry – a modern Finnish business

Although wind electricity production was often marginalised among the interviewees and not always seen as a real business, the wind power sector also consists of the wind turbine industry. It was discussed in very different terms.

The wind turbine and component industry was given an extremely positive image in the interviews. I will discuss two aspects through which this positive image is constructed: the Finnish national economy and modern technology.

The turbine industry represented export income and jobs, which were valued for reasons of Finnish welfare. The tone was sometimes quite patriotic.

*In Germany by the end of 2001 they had 34,000 jobs in this industry [...] I see here a similar opportunity for this country. [...] I see this as a possibility for people to live. [...] I see this as a way for the country to manage in the future too.*

While some interviewees stressed the environmental benefits of wind power and considered the industry a plus, others saw the industry as being as important as the environmental benefits or even the main motive. Even those actors who were mostly concerned with environmental issues brought up the economic benefits. The promotion of Finnish interests also extended to the way state funds used to subsidize wind power were discussed. There was a desire to use the funds in a cost-effective manner and to direct as many benefits to Finland as possible.

The remarks were not always directly about the interviewee's own wishes, however. Sometimes the interviewees made references to an assumed governmental interest in promoting wind energy for export and employment opportunities. Nevertheless, I consider this to be part of the same discourse, since the speakers seemed to agree with the view that the wind power industry benefits the country as a whole.

This emphasis on Finnish interests also emerged in connection with environmental issues, but only through a defence of Finnish landscapes against turbines. The environmental benefits were usually seen as global rather than national. They were often referred to in the context of an obligation to cut emissions, an obligation which emerged from a global moral responsibility or from international organisations and agreements.

The rapid development of the wind power technology was reflected in the way turbine technology was seen to represent modernity and highly developed skills and expertise, a way of the future. In this discourse it was

not only the Finnish technology industry that was emphasised, but also technological development itself, which was assigned an intrinsic value. This emphasis probably arose partly from the technological education of the majority of the interviewees. The good results achieved by Finnish companies also evoked pride in Finnish technology and expertise. There was both national pride and what could be called the “engineer pride” of doing things well, to use a phrase introduced by Lundgren (2002: 75-76).

Since turbine manufacture and wind electricity production are tied together, the sense of modernity and advanced technology extends to wind electricity production. In economic terms, however, only turbine manufacture has a rather uniform image of “real business”. There was no definition struggle about its relevance as there was about wind electricity production. The only doubts were about the future growth of the sector in Finland, as some interviewees suspected that the industry could be relocated or sold to foreign companies<sup>11</sup>.

### 6.1.6 The home market

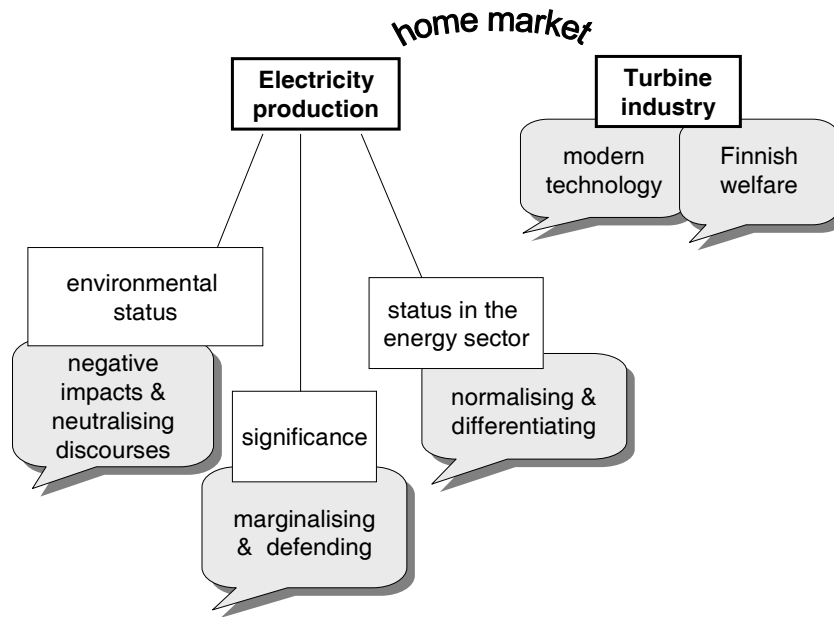
Wind electricity production was often seen as not being economically sensible. The turbine industry may be economically lucrative, but how was it connected to the environmental benefits of electricity production? At the global level, both types of benefits can be obtained, but exporting turbines and their components does not help to meet Finland's environmental obligations.

The practical bridge that joins wind electricity production and the turbine industry is the idea of a home market for wind turbines: having a home market benefits the industry and makes exporting easier, because it allows the testing of new innovations on “home ground” where monitoring and maintenance are easier. This argument was brought up by many interviewees, and it has been referred to also by such figures as Finland's Minister for Foreign Trade and Development, Paula Lehtomäki (Lehtomäki 2004). In the interviews it was also thought that international customers might find a lack of domestic references peculiar.

The various discourses about wind electricity production and the wind turbine industry are illustrated in Figure 7. Wind electricity production and turbine manufacture are often bound together in discourse, as if one were inextricably linked to the other. For promoters of wind power, there is a benefit in presenting them as being interdependent. In this way, support for wind electricity can be associated with the economic benefits of the turbine industry. Promoting wind power in Finland becomes economically rational and even patriotic.

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<sup>11</sup> In fact, foreign companies acquired the majority shares in the Finnish wind power companies *Moventas* and *Winwind* in January 2007 (<http://www.industrikapital.com/templates/press.aspx?id=2983>; [http://www.taloussanomat.fi/page.php?page\\_id=26&news\\_id=20071900](http://www.taloussanomat.fi/page.php?page_id=26&news_id=20071900)).



**Figure 7.** Discourses about wind electricity production and the wind turbine industry in Finland.

Some interviewees considered the industry to be quite crucial to the political support for wind power, as demonstrated by the following quote:

*No wind power issues would have been carried through the political decision-making process in Finland if we did not have this manufacturing industry, because these environmental arguments still don't sell very well in Parliament.*

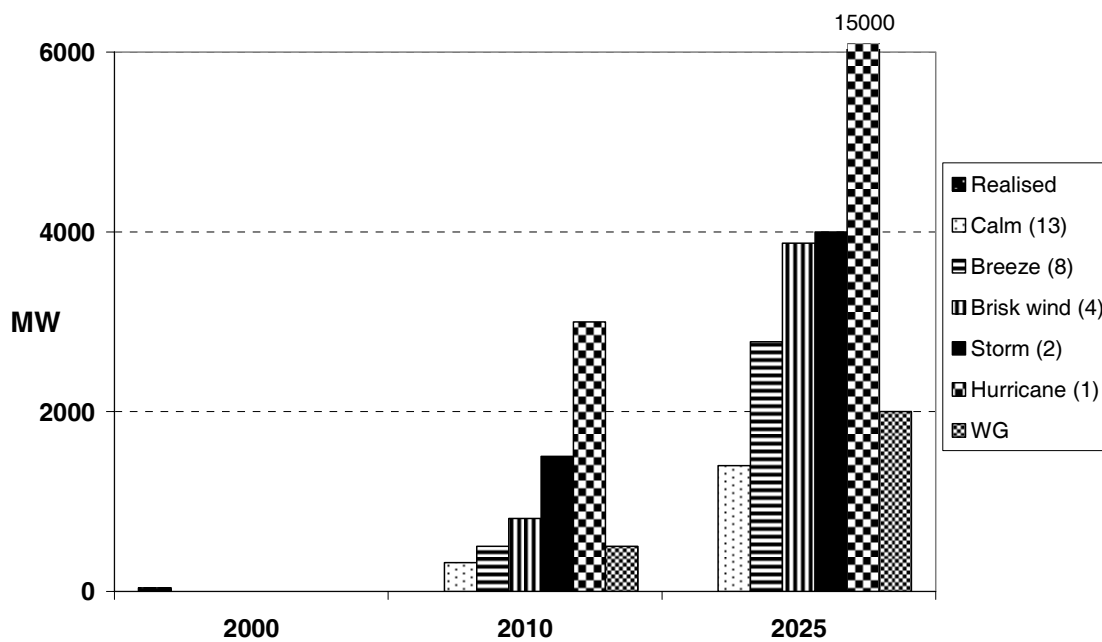
The home market reasoning was not directly contested in any interview, but some argued that since the real market is abroad and since the Finnish component manufacturers have to adapt to turbine manufacturers' specifications, the importance of the domestic market is very small. A home market may be desirable in its own right, but it will not affect the export industry. Still, the connection between the home and export markets was not contested very strongly in the interviews. One reason is surely that we would like this link to exist, since it would mean simultaneous environmental and economic benefits. As Hajer (1995: 66-67) has noted, the influence and acceptability of a discourse also depend on its "sounding right".

## 6.2 Images of the future of Finnish wind power

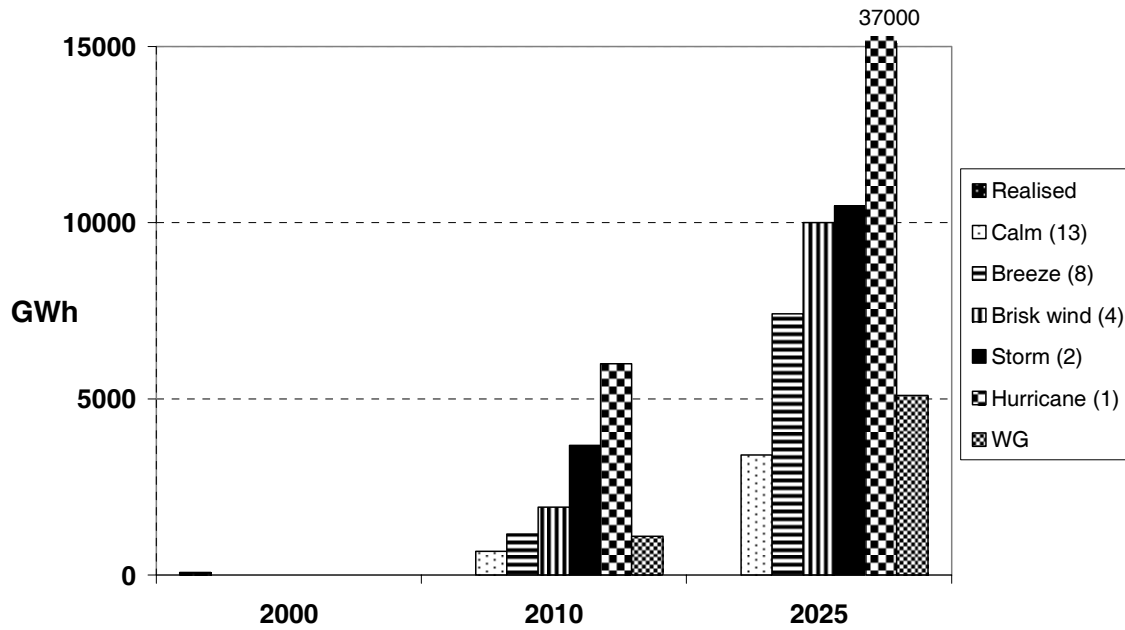
Five scenarios for Finland's wind power up to the year 2025 were constructed during this study. The scenarios are combinations of several actors' views (with the exception of the scenario Hurricane, which only contains the view of

one respondent) (I). Each scenario was considered possible by at least one respondent. In this way, the scenarios demonstrate the variety of views regarding the future of Finnish wind electricity production.

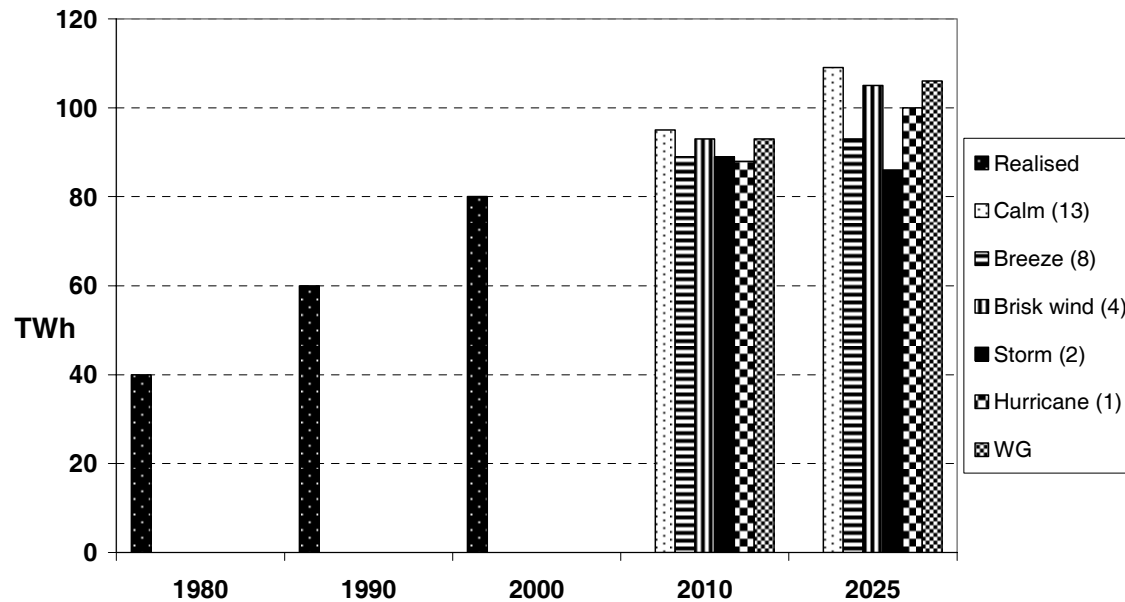
The scenarios were named “Calm”, “Breeze”, “Brisk wind”, “Storm”, and “Hurricane”. Figures 8, 9, and 10 illustrate Finnish wind power capacity, the Finnish wind electricity production, and Finnish electricity consumption, respectively, of the scenarios. “WG” stands for the working group proposal for the updated *Action plan for renewable energy 2003-2006* (MTI 2003) and represented the wind power policy chosen in Finland. In the updated Action plan, the target for wind power capacity was set as 500 MW for the year 2010, and a vision of 2,000 MW for the year 2025 was expressed.



**Figure 8.** Wind power capacity in Finland in 2000 and six scenarios for the years 2010 and 2025. Note that x-axis (time) is not on scale. “WG” stands for the working group proposal for the update of the Action plan (MTI 2003) (I: 1936).



**Figure 9.** Production of wind electricity in Finland in 2000 and six scenarios for the years 2010 and 2025. Note that x-axis (time) is not on scale. “WG” stands for the working group proposal for the update of the Action plan (MTI 2003) (I: 1936).



**Figure 10.** Consumption of electricity in Finland 1980 – 2000 and six scenarios for the years 2010 and 2025. Note that x-axis (time) is not on scale. “WG” stands for the working group proposal for the update of the Action plan (MTI 2003); however, the value for consumption was not given directly in the document, but is calculated from the figures given for electricity production from renewable sources, and the share of such electricity in total consumption (I: 1936).

### **“Calm”**

In the scenario “Calm”, the wind power capacity remains at 319 MW in 2010 and 1,400 MW in 2025, i.e., clearly under the target envisioned in the Action plan. Some of the respondents, whose future images contributed to this scenario, did not believe in the financial competitiveness of wind power, even in the year 2025. Few households buy specifically labelled wind electricity, and it is mainly the rise of electricity prices in general that contributes to the increasing competitiveness of wind power. Electricity prices rise as a result of internalising external costs of energy production, for example, in the form of environmental taxes. Subsidization of wind power will continue as before, and support is available to a limited number of turbines only. Construction of offshore wind farms progresses slowly until 2010 and then more rapidly. Offshore wind farms meet with less public resistance than onshore installations. Electricity consumption increases at least until the year 2025, and in one answer, this was even considered desirable. This hope was caused by a desire to substitute electricity for other energy carriers, particularly in transport, which could reduce the emissions from the total energy use (I).

### **“Breeze”**

In the scenario “Breeze”, the wind power capacity is close to the official targets: 500 MW in 2010 and 2,778 MW in 2025. However, finding suitable sites is rather difficult, particularly on account of an unclear or undeveloped bureaucracy that does not take wind power into account. Offshore construction starts in earnest after 2010. Technological development is fast. Wind power becomes economically competitive sometime after the year 2010. Electricity consumption grows, but saturation can be reached with the help of energy conservation, for example. Internalisation of the external costs of energy production will go forward (I). Different respondents had sharply conflicting views about suitable wind power policy instruments (these views will be discussed in Section 6.3).

### **“Brisk wind”**

In the scenario “Brisk wind”, wind power progresses much faster than envisioned in the Action plan: 813 MW (2010) and 3,875 MW (2025). In fact, the share of wind electricity is nearly 10% of electricity consumption in the year 2025, but electricity consumption grows as well. The key to this scenario is a more “consistent” energy policy. It includes a transition from investment subsidies to some other, more effective policy instrument, a stricter taxation of more polluting energy forms, and the good example set by the public sector to purchase “green” electricity (I).

### “Storm”

In the “Storm” scenario, wind power is doing well: 1,500 MW (2010) and 4,000 MW (2025). A strong energy efficiency policy and higher electricity prices will lead to decreasing electricity consumption. The fast growth of wind power combined with the decrease of electricity use resembles ecological structural reform of the economy<sup>12</sup>. The importance of technology and knowledge increases in the economy. Wind power is sold as green electricity, but the sales are based on mandatory quotas. Investment subsidy is abandoned. The economic competitiveness of wind power will be reached soon after the year 2010, partly as a result of developing technology and economies of scale. Siting problems lessen as Finnish citizens grow accustomed to wind turbines and/or learn to value their positive environmental impact (I).

### “Hurricane”

The “Hurricane” constitutes a category all its own: wind power capacity reaches 3,000 MW already in the year 2010 and 15,000 MW in 2025. Accordingly, in the year 2025, as much as 37% of the electricity consumed in Finland is supplied by wind power. The key to this scenario is a strong political will to advance wind power, demonstrated through various policy instruments. For example, all municipalities are required to appoint suitable areas for wind power development. Although three quarters of the capacity are built offshore, turbines are also found on the coastline and inland. In addition, small turbines are in use, often using vertical axis solutions. It is easier to find sites for small turbines, although siting problems diminish in general as people get used to turbines. As a result of building on less optimal sites, the productivity of wind power capacity is low, but the economies of scale increase the competitiveness of wind power. In this scenario – in contrast to the other scenarios – technological development results from the increasing use of wind power and not vice versa. In 2010, wind power is sold separately as green electricity, but by the year 2025 its price is competitive. The development is caused largely by the inclusion of external costs with the prices of more polluting energy forms. The growth of electricity consumption slows down, partly as a result of the rising prices (I).

A comparison of the six scenarios allows some general conclusions to be drawn. First, the scenarios show varying views of the role wind power is expected to have in the Finnish electricity sector. In Table 3, the share of wind power in the total Finnish electricity consumption in the scenarios is presented. As can be seen, considerable differences exist. The share varies between 0.7% and 6.8% in 2010 and between 3.1% and 37% in 2025.

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<sup>12</sup> Ecological structural reform can be defined as “delinking economic growth from the consumption of ecologically significant resources, like energy and materials” (Simonis 1994).

**Table 3.** Six scenarios for the share of wind electricity in Finnish electricity consumption (modified from I: 1935).

	Share of wind 2010	Share of wind 2025
Calm	0.7%	3.1%
Breeze	1.3%	8.0%
Brisk wind	2.1%	9.5%
Storm	4.1%	12%
Hurricane	6.8%	37%
WG	1.2%	4.8%

It is clear that the wind power actors have very different opinions about the potential of wind power in Finland and of the significance of its role. Of course, compared to the present share (0.2% in the year 2005), all scenarios show substantial growth. However, if the goal is to reach sustainability in energy production and not be dependent on fossil fuels, a much larger share than a small percentage from wind power would seem necessary. After all, other renewable energy sources have their limits too.

Furthermore, rising electricity prices were generally expected. This would result from policy measures such as taxes that internalise the external costs of energy production. Because these measures would not affect the production costs of wind power, they would increase its competitiveness in the market. Electricity prices were also expected to rise as new capacity has to be constructed in order to replace old, decommissioned plants and meet the rising demand for electricity (I). The view that CO<sub>2</sub>-emission permits or similar measures support wind power more than policies that are directed at wind power dissemination has also been supported by the results of scenarios created for the United States by Hadley and Short (2001) and by a study of the Finnish energy sector by Honkatukia *et al.* (2003).

However, only in the scenario Hurricane was the rising price level considered sufficient; in other scenarios the improving technological and economic performance of wind power was also emphasised. Whether the improvements would result from technological research and development (R&D) or from the use of technology that would support increasing know-how and economies of scale was not so clear (I). According to Hadley and Short (2001), there are no reliable quantitative methods to predict how R&D funding improves the cost and performance of advanced energy technologies. This uncertainty about future costs has also been observed by McDonald and Schrattenholzer (2001), who found a wide variety of learning rates for wind power in literature, ranging from 4 to 32 percent<sup>13</sup>.

<sup>13</sup> The costs of technologies can often be seen to decline by a steady percentage (= learning rate or experience rate) over each doubling of cumulative sales.



In any case, the most pessimistic interviewees did not expect wind power to be financially competitive without subsidies, even in the year 2025 (I). This view is connected to the marginalisation – defence discourses described previously in Section 6.1.

### **6.3 How should wind power be promoted in Finland?**

As the scenarios already revealed, Finnish wind power actors as represented by the interviewees have very different views about the suitability of methods to promote wind power. In this section I will discuss these views in more detail.

I will first discuss the criteria used by the interviewees to consider the merits of wind power policy instruments. These are divided into two categories. The interviewees used both process-oriented criteria, which were largely about the ability of the instrument to produce results or about their suitability for Finland. They also used a number of value-based criteria, which concerned the “goodness” and acceptability of instruments (II).

In addition, in Section 6.3.3, I will discuss the role of consumers and the green electricity market in promoting wind power. This discussion is connected to that of instruments, but also merits a look on its own. Since the liberalisation and deregulation of electricity markets, consumers have become more powerful actors in influencing electricity production structures – at least in theory. Many wind power actors emphasise the consumers' role, but others strongly disagree. This issue is one of the most fundamental questions in how (or even, whether) the interviewees thought wind power should be promoted in Finland through policy instruments.

I asked the interviewees' opinions about the probability and desirability of several possible wind power policy instruments (II). Instruments currently in use in Finland were included as well as some examples of instruments used in other countries. These instruments represent different types of regulation: information policies, administrative regulations, and a variety of economic tools. Nine instruments were included on the questionnaire (see Appendix 3, question 12):

- Investment subsidy,
- Tax subsidy (e.g., refund of the energy tax),
- Research, development and demonstration funding,
- Advice about wind power for energy companies,
- Information campaigns about wind power for consumers,
- A wind electricity quota set for electricity suppliers<sup>14</sup>,

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<sup>14</sup> Wind electricity quota would be similar to a green certificate quota, in fact, such a quota could be organised with certificates. Although a broader system encompassing all renewable energy sources is both more common and more practicable (see del Río and Gual, 2004), the arguments given in the interviews for and against wind electricity quota were essentially applicable also to renewable electricity quota. Therefore, the views of wind electricity quotas can here be seen to refer to more general quotas as well.

- A guaranteed price for wind electricity,
- A governmental label system on “green electricity”, and
- A duty to build wind power by state-owned energy companies.

Some of the answers might have been different, had the level of support or the stringency of the policies been considered, but it would have made the questionnaire too cumbersome. Here I will concentrate on the answers given for the year 2010. The arguments for 2025 were largely the same, although, on average, each policy was considered less preferable for the year 2025 than for 2010. This difference mainly reflected the assumption that by 2025 wind power would be (at least more) competitive in the electricity market, and would not require (as much) support from the state (II).

Of the instruments included in the questionnaire, investment subsidy, tax refund, and research, development and demonstration (RD&D) funding were considered the most probable instruments to be in use in 2010, and they were all fairly preferable as well. The most preferred instrument was RD&D funding (II). The negative experiences of some early governmental wind power R&D programmes (described in Section 4.3.3) do not seem to have created doubt about the benefits of R&D funding, possibly because wind power technology has developed so much since the early years.

The perceived probability of these instruments can be understood at least partly through the fact that they are in use now (and were at the time of the interviews). Images of the future are naturally restricted by the present, and people may have difficulty envisioning dramatic changes. In addition, the time it takes to envision, design, decide upon, and put in place new policies reduces the probability of a drastically different policy system in the short term (II).

Information policies, such as consumer campaigns, were considered rather probable and quite preferable, but the interviewees were rarely very enthusiastic about them. The state companies' obligation to invest in wind power was considered the least likely tool and was very unpopular as well. Such a move was viewed as placing a state-owned company in a different position from other companies in the market in an unacceptable way (II).

The answers were distributed in a relatively uniform manner when it came to the above-mentioned policies. In addition, guaranteed price and a wind electricity quota were rather uniformly considered to be fairly improbable. However, the views of their desirability were divided (II). They were approved of by some, mainly for their perceived effectiveness, but others disapproved for various reasons, which will be discussed later in this chapter.

### 6.3.1 Process-oriented criteria

All policy is hoped to be effective, i.e., to have an impact on the intended targets. Effectiveness was often used by the interviewees as a criterion when they discussed the merits of different policy instruments, but many other criteria were also invoked. Cost-effectiveness, in particular, was considered

very important. Many interviewees, regardless of their background organisations, were concerned about the cost of policy instruments. They wanted to protect the Finnish state, taxpayers, and the national economy. For example, although feed-in tariffs were thought to be an effective method, they were often thought to be too expensive for Finnish society (II). Keeping energy prices “competitive” in order to protect industries from paying too much for energy has been an important objective in all Finnish energy policy. Sometimes this policy seems to be in conflict with environmental objectives, but both objectives can be – and often are – included side by side in political documents (Tikkanen 2006: 113-114).

An often expressed view was that eventually all instruments should be phased out as the competitiveness of wind power increases. In fact, to many interviewees that increase is the goal of wind power policy. This view reflects the criterion of dynamic efficiency (II). Certain researchers (e.g., Driesen 2003) have emphasised the difference between cost-effectiveness, which is often a static issue, and dynamic efficiency, which is used with a different time frame of analysis. A method may be efficient at a given time, but dynamic efficiency refers to the method's ability to foster innovation, so that in the future the task may be undertaken even more efficiently<sup>15</sup>.

How is the desired increased competitiveness to be achieved then? Two main views emerged from the interviews. Wind power expansion was often seen to follow from the development of wind power technology. Research and development funding was therefore widely favoured by the interviewees (II). The Finnish investment subsidy is also directed at wind power projects that include some new technological innovation, creating “technology push”.

However, some interviewees thought that the mechanism works the other way around: it is the development of technology that follows from the increased use of wind power. Such development would result from “learning-by-doing” rather than “learning-by-searching”. Competitiveness would also result from economies of scale. Accordingly, these interviewees called for policy instruments that would create “market pull” and increase the capacity of wind power instead of targeting technological development. These interviewees did not generally view investment subsidy as a viable method for increasing capacity. Instead, they considered it to be an instrument mainly suited for introducing very new innovations to the market (II).

This conflict of views is not unique to Finland. Internationally, studies have been carried out to discover what would be the most effective way of lowering the costs of wind power, but conclusive results have not yet been found. For example, Kamp (2002) showed that different types of learning

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<sup>15</sup> When policy is evaluated, the choice of criteria obviously makes a great difference to the results. For example, in a report by the Finnish State Audit Office (SAO 2003), mainly cost-effectiveness and effectiveness were used as criteria when evaluating Finnish energy subsidies, and dynamic efficiency was not even mentioned. In addition, the comparisons were made between different energy forms, not between different policy instruments that are in use or that could be in use. The finding was that in reducing CO<sub>2</sub> emissions, it is more cost-effective to support biomass than wind power. With an alternative time frame or criteria, the results might have been quite different.

have taken place in wind power development in different countries and at different times. Hemmelskamp (1999: 79-85) argued that the German feed-in tariff was more effective in inducing technological development and particularly cost reductions than were investment subsidies. However, the analysis by Klaassen *et al.* (2005) indicates that the cost reductions have been specific to wind power technology rather than country specific, in spite of the varying policies in different countries.

Sawin (2001) and Söderholm *et al.* (2007), among others, have considered stable policies to be crucial for wind power investments. *Predictability and stability* of regulation were also emphasised by some Finnish wind power actors. Since the current Finnish policies are based on government funds, the available sums are decided yearly in budget negotiations. This makes it more difficult to plan future projects. The investor's risk is increased by changing political priorities, which the interviewees referred to as political risk (II).

Flexibility is the counterpart of stability and predictability of regulation. Flexibility of regulation was highly valued by many interviewees. In fact, the criterion "the way things are done in Finland" was often used to reject instruments that would increase predictability and stability of wind power policy, but at the same time decrease its flexibility. There was a reluctance to commit the state to particular policy instruments in the future; sometimes it was even considered unfair to tie the hands of future governments through such measures. This argument was referred to particularly in the context of long-term commitment to financial instruments, such as the feed-in tariffs and a fund to which money could be collected beforehand for future subsidy needs (II). Such funds are rare in Finland, although they exist for the upkeep of emergency stores of fuels, and for nuclear waste disposal, for which money is being collected in the price of nuclear electricity.

However, stability could be increased even if "old" instruments were used. Holttinen (1993: 55) concluded that wind power would best be supported with investment subsidies, but he asked for clear decisions concerning the time or capacity limit until which subsidies would be available and certainty on how large the subsidies would be. Similar thoughts were expressed in some interviews, but the unwillingness to tie the hands of future governments applies to these suggestions as well. Here the conflict seems to be between flexibility and predictability rather than between different instruments.

Reflecting the deregulation of the electricity market, market-based instruments were called for in the interviews, although the concept "market-based" is somewhat vague, and there was some confusion as to what instruments can be classified as such (II). Sandén and Åstrand (2005) have noted that the definitions of what is market-based tend to be built on opposition to command-and-control regulation. They themselves defined as market-based economic incentives that stimulate technology use and market formation. Quotas and guaranteed prices are clearly such instruments, just like subsidies, but many interviewees saw these policies as being

fundamentally different. Being market-based does not really seem to be an either/or issue but rather a continuum from strict directives to very light touches on market conditions. Many interviewees accepted a rather limited array of instruments into this category. Accordingly, *compatibility with the deregulated market* was a crucial criterion, used particularly against guaranteed prices and a wind electricity quota (II).

On the whole, increased regulation of wind power was considered to be contradictory to the general strategy of deregulation. Going against this strategy, for something as relatively insignificant as wind power currently is, was thought to be difficult or even a little absurd (II).

The emphasis on deregulation and diminishing state intervention in the market has been a feature not just of the energy sector. Finnish policy style changed during the 1990s, to a great extent as a response to the deep economic depression. Government spending was cut, and efficiency and market-orientation were increasingly valued and strived for in the public sector (Tiihonen 2000).

### 6.3.2 Value-based criteria

In addition to the process-oriented criteria, a number of value-based criteria were used by the interviewees. The two types of criteria were linked, and sometimes the distinction is difficult to make. For example, in the discussion of cost-effectiveness above, I introduced the patriotic desire to protect Finnish interests. In addition, deregulated “free” markets, and policies that are compatible with them, were not only valued because they were expected to bring about the best economic results, but also because, for some actors, they had an intrinsic value and were seen as representing western values and way of life and as enabling voluntary and individual action that demonstrates personal responsibility for the environment (II).

Similarly, some actors criticised the use of binding policies such as quotas for being “dictatorial”. This dictatorial nature did not mean that these policies were never accepted, however. Because of their effectiveness, even less pleasant instruments were desirable to some (II).

Justness of policy was another important criterion. However, valuing and using this criterion led to drastically different policy recommendations in the interviews. First, it was connected to the polluter-pays principle: some thought that the most just way of promoting wind power would be the internalisation of external costs of competing energy forms, for example, through a CO<sub>2</sub> tax (II).

Second, justness was associated with the consumers' role. Voluntary purchases by environmentally concerned citizens were seen as the most just way of increasing wind power production: if, and only if, a person wants wind power, he/she should pay for it. Any form of subsidization means that the consumer gets an environmentally better but more expensively produced product for the same price (II).

A third view could be called the “beneficiary-pays principle”. Some interviewees argued that since the non-polluting energy production benefits the whole society, the responsibility of changing the electricity production structure should not be left to individual households. Instead, the state should ensure that the benefits that are shared by all are also paid for by all (II). This view can support subsidization with state funds, for example.

Sawin (2001: 236, 433) argued that a system of guaranteed price is just, because through it those who consume more electricity also pay more for the ecologisation of the energy sector. This argument did not emerge in the interviews, however.

### 6.3.3 The role of consumers and the green electricity market

Since Finnish wind power generation takes place in a deregulated electricity market, the role of consumers in promoting wind power is one of the central issues. Energy sector actors base their decisions regarding renewable energy policies or market strategies partly on past consumer behaviour and on assumptions about the future behaviour. I asked how consumers are expected to behave and how do wind power actors interpret consumer behaviour (III). As can be seen from the discussion above about justness, perceptions about the consumers' role were not unanimous.

Two main approaches emerged from the interviews. Some actors consider voluntary consumer choice to be too slow a method for increasing production of renewable electricity. Although consumer demand is desirable, the responsibility for changing energy production structures cannot be left to consumers. Instead, the state has to take an active role and implement effective policies (III). These policies can include “dictatorial” measures, such as green electricity quotas.

Other interviewees emphasised voluntarism and/or the view of consumers as sovereign actors in the market whose choices determine the direction of investments (III). The emphasis upon competition in the free market and the importance some interviewees gave to consumer choice would seem to point to demand-side policies that would create a market-driven wind power development. Interestingly, the interviewees' enthusiasm for information policies that could inspire consumer demand was largely lacking (II). Interviewees did not expect such measures to be particularly effective, since they thought that Finns have low environmental consciousness. Some interviewees, however, thought that the marketing efforts of wind electricity companies had been insufficient, and more demand could be created (III). A wind electricity quota would clearly create demand, but many disapproved of quotas. Instead, they supported supply-side policies such as investment and production subsidies (II).

These two attitudes reflect the two functions that the interviewees assigned to the green electricity market. They either saw it as a tool for environmental improvement of the energy sector or as a site for free

competition that should be competitive and efficient. It is this latter view that reduced the perceived legitimacy of strong regulation, which some interviewees saw as being in contradiction with free markets (III).

Here it must be noted that those who emphasised the need for regulation did not argue against the market economy itself. Rather they considered the renewable energy forms' lack of competitiveness to be a market failure. The failure could be caused by different factors, such as the fact that the negative environmental impact of energy production is not internalised in energy prices or that consumers lack information about energy forms. It was this market failure that legitimised the stronger regulation measures.

The interviewees usually saw consumers as rational, systematic, and goal-oriented. Therefore, the observed consumer passivity was interpreted as a lack of interest in renewable electricity production or in environmental issues in general or as unwillingness to pay "extra" for renewable energy. For some actors, consumer passivity caused doubts about the legitimacy of strong wind power policy measures (III).

This interpretation followed from a failure to distinguish between *having* environmental values and *acting upon* those values. Economic theory, in particular, often assumes that choices reflect values, since rational behaviour is defined as acting consistently according to one's beliefs. However, Uusitalo (1990) demonstrated that in reality, people's preferences are not always consistent or transitive. Consumer research has shown that environmental consciousness does not automatically translate into environmentally responsible behaviour (e.g., Brand 1997; Kollmuss and Agyeman 2002).

Often interviewees also had the view that "consumer equals citizen", namely, a consumer's role was seen as being no different from that of a citizen. The following quote illustrates this attitude perfectly:

*Electricity consumers are the same as consumers, which means citizens, and they elect Parliament.*

However, a person in the role of a consumer may be mainly concerned with getting the cheapest electricity contract, but the same person in the role of a concerned citizen may wish to vote for a party that supports subsidies for renewable energy (III).

Sagoff (1988: 50-53) demonstrated this difference by describing his students' reaction to a proposed ski resort in a quasi-wilderness area in the middle of a national park. The students had little interest in visiting a national park and were instead quite enthusiastic about visiting the proposed ski resort. Nevertheless, they were aghast at the idea that the government would allow a ski resort to damage a national park. Their consumer interests were overruled by their citizen preferences.<sup>16</sup>

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<sup>16</sup> Ball (1988) takes the distinction between the roles of a consumer and a citizen further. He has criticised the "economic" interpretation of citizenship, which he sees to exist in certain areas of political theory. He does not see the real problem to lie in these scientific theories

The significance of emphasising people's different roles in energy policy choices can be quite notable for renewable energy development, as has been reported by Batley *et al.* (2001). They concluded, on the basis of surveys, that the UK consumers' willingness to pay for green electricity was too low for the consumer demand to result in an increase in the capacity of renewable electricity. On the other hand, a much larger percentage of people wanted to see the government support renewable electricity production through a citizen levy.

The consumers themselves identified a wide range of barriers for green electricity purchases in interviews conducted by Salmela (Salmela 2004; III). These barriers included a limited knowledge about the liberalised electricity market and insufficient skills in handling the market. Sometimes consumers also doubted whether they could do much to influence the environmental impact of electricity production, since they assumed that other consumers will not buy green electricity. The possibility to "free-ride" is notable: a consumer can obtain the benefit of a better environment without paying for the environmentally better product himself/herself if another consumer pays (Uusitalo 1991: 37-39; Arkesteijn and Oerlemans 2005).

On the whole, the wind power actors and consumers had very different points of view when they discussed green electricity purchases. The former discussed the issue on a general and societal level. The consumers, on the other hand, looked at the matter at a very personal level, where time, money, and other resources are significant (III). It is notable that not all the interviewees who emphasised the importance of consumers and advocated wind power were buying wind electricity for their own households.

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but rather in the way this interpretation is adopted into the language of political agents themselves. According to this definition, citizens are seen as "self-interested rational actors bent on maximizing their own utility" (Ball 1988, 123), even when participating in a political process such as voting. Following Ball, the problem is not just that consumer behaviour is allowed to be a substitute for democratic processes ("voting with your wallet" as the Finnish saying goes), but that the voters themselves are expected to think and behave as consumers do.



## 7 Discussion

I have answered the research question of my study in the previous chapter by describing how Finnish wind power actors perceive and discuss wind power, its future, and certain means of promoting its use in Finland. In this chapter, I will discuss the results further. First, I will return to the image of wind power created through discourses. Then, in Sections 7.2-7.4, I will consider to what extent the views of the wind power actors are congruent with the Finnish wind power policy. Although many of these actors directly influence the national wind power policy, their views and opinions alone naturally do not explain the policy choices. However, analysing these views can make certain Finnish choices more understandable. I will also make some observations regarding developments in official policy since the time the interviews were conducted. In Section 7.5, I offer some views about the future of wind power in Finland, and then in Section 7.6, I consider wind power's role in the ecological modernisation of the Finnish energy sector.

### ***7.1 Conflicting images of wind power and a useful story line***

Although they are not necessarily found in exactly this form in any one person's speech, the images of wind power constructed by the various discourses could be summarised as follows:

1) The negative environmental impacts caused by wind power are either not real or they do not constitute a significant barrier to large-scale use of wind power in Finland. Wind power is (or can be) a normal, credible, needful, and significant part of electricity production in Finland, and it will also be competitive in the fairly near future. It is not necessarily, however, in competition with nuclear power, since the market has room for both power production forms. Wind power can provide both economic and environmental benefits, since installing wind power in Finland will also increase the competitiveness of the Finnish wind turbine industry.

2) Wind power has negative environmental impacts, associated particularly with unacceptable changes to the landscape, and this will prevent large-scale use of wind power in Finland. Use of wind power to a small extent may be desirable, but wind power will not have real significance in electricity production. It will not be competitive for a long time and cannot be an alternative to larger power production forms such as nuclear power or biomass. Wind power also causes problems in controlling electricity in the electricity market and on the grids. The wind turbine industry, however, has value and may need domestic references and a home ground for testing new innovations.

Clearly, the wind power actors' images influence the actors' objectives for wind power policy making and wind power construction and therefore have great significance for the development of wind power and choices made

in wind power policy. If wind power is and is to remain an insignificant and marginal electricity production form, it cannot have a meaningful role in reaching energy policy goals, such as the reduction of emissions from electricity production or the security of energy supply. Therefore, setting high targets or employing stringent and possibly expensive wind power policy measures does not make sense. For electricity companies there is little reason to invest money and other resources into a production form that will remain marginal.

On the other hand, understanding wind power as a credible, useful, and strongly growing energy form provides an incentive to invest in its growth, both for policy makers and for the private sector.

What these two images about wind power have in common is a positive attitude towards the wind turbine industry (and often towards technology and technological development in general). Many interviewees saw the domestic wind turbine market as useful or even necessary for a domestic wind turbine industry that wishes to enter or maintain its position in the export market (Section 6.1.6). The benefits of the home market are widely acknowledged in Finland, although there are also dissenting voices, as will be discussed in Section 7.3.

The home market reasoning can be said to have become a “story line”. Hajer (1995: 62) defines story lines as “narratives on social reality through which elements from many different domains are combined and that provide actors with a set of symbolic references that suggest a common understanding” (Hajer 1995: 62). The concept of a story line has been used in energy policy research, for example, by Luukkanen (2000), who describes “green electricity” as a story line in which various environmental problems, consumers, product information, and possible changes in electricity production structures are combined.

In introducing the concept of story lines, Hajer (1995: 64) discussed “acid rain”, which provides a “causal story that gives meaning to previously singular and unrelated events such as dead fish, dying trees, and smoking stacks or dirt”. In a very similar way, “home market” provides a causal story, where the construction of wind turbines on Finnish coasts provides concrete benefits to the industry that exports turbines and their components around the world.

According to Vehmas (2002: 27), a political story line is commonly a simplified and “factualised” state of affairs that supports a particular political goal and that is repeated in political discussion. Since the value of wind turbine industry is so widely accepted in Finland, the advocates of wind electricity production can refer to the industry and to the home market story line in promoting their objective. The danger in this, however, lies in overemphasising the home market argument. First, the focus of wind power policy may be too much on industrial needs, so that the policy tools that are used do not optimally support wind electricity production. Second, if the home market argument is successfully contested, much of the motive and

legitimacy of supporting wind power production in Finland disappears. These issues will be discussed further in Section 7.3.

## **7.2 Wind power potential and the quantitative target of wind power policy**

The scenarios described in this study demonstrated wind power actors' views about possible wind power developments until the year 2025. The official Finnish target for wind power capacity was seen to be relatively modest in relation to the possibilities envisioned in the scenarios, as follows:

The target was set as 500 MW for the year 2010. In addition, there is a vision of 2,000 MW for the year 2025 (MTI 2003). These numbers were first proposed in the *Background report for the action plan for renewable energy sources* (MTI 1999b). These numbers have not been deviated from in either of the working groups (for the original Action plan and its update [MTI 1999a; 2003]), in spite of alternative numbers suggested by some working group members. The interviewees' estimates for wind power capacity in 2025 varied between 500 and 5,000 MW in probable cases, and between 1,000 and 15,000 MW in preferable ones. All of these numbers were considered possible by at least some respondents, and are given some credence by experiences in other countries, described in Chapter 4.

What could explain the incongruity between the wind power actors' views and the relatively modest official target? The simple answer is that the interviewees in this study and the people who produced the working group reports were not exactly the same. It is possible that the wider representation of commercial and research organisations in this study brought about the higher numbers. However, since the representatives of such commercial interests and researchers have often been given the opportunity to voice their opinions to policy makers in the working groups and in Parliament, this does not really answer the question of why the more modest views have been selected as the official targets. At least four possible explanations come to mind.

First, the variety of views among the interviewees was quite striking. The results show significant uncertainties about the potential of wind power in Finland and about its future growth. The uncertainty was evident in doubts that even the official targets could be met. In addition, some thought that wind power would require subsidies even in 2025. Considerable doubts about the (economic) potential of wind power in Finland make high wind power capacity targets seem somewhat irrational.

When discussing the Finnish environmental policy style, Sairinen and Lindholm (2004) have called Finland a "realistic pragmatist". This attitude or policy style could partly explain the modest wind power targets, because it reflects the view stated by one interviewee: Finns do not like setting targets they do not realistically expect to be able to reach. Sairinen and Lindholm (2004: 78) state that "the principle of 'realistic pragmatism' tends to silence

voices that demand more innovative, more elevated and more ambitious levels of domestic environmental protection”.

Second, several interviewees expressed concern about the costs of wind power policy. Financing a large amount of wind power might be expensive. Even if the money for it was found within the market, rather than from state funds, it could raise the price of electricity. This would be in contradiction with the energy policy goal of keeping electricity prices – and the Finnish energy-intensive industry – competitive.

Third, a topic that undermines the legitimacy of higher targets is the assumption that consumer passivity signifies citizens’ lack of interest in renewable electricity and in environmental issues in general. The difference between the roles of consumer and citizen is not well known or accepted among the wind power actors, as discussed in Section 6.3.3.

A fourth explanatory factor is the trust in expertise. For example, one interviewee did not consider it sensible to create preferable and probable future images that are very different from one another (his two cases were in the same cluster), because he trusted in the numbers given by the experts in the *Action plan for renewable energy sources* and its background report (MTI 1999a; 1999b). However, the person responsible for the wind power section of the Background report also submitted a probable and a preferable case to this study, and these were not identical (his probable and preferable cases were in different clusters).

Expertise is highly valued in Finland, and often it is formal education, professions, and positions in organisations that are seen to give experts their authority (Saaristo 2000). The reliance on expertise can be excessive, especially in circumstances of considerable uncertainty. The targets expressed in the Action plan (MTI 2003) are not based on particularly detailed assumptions, and there seems to be little reason to consider those figures significantly more realistic than those given by the interviewees.

The Background report (MTI 1999b) was made in the VTT (Technical Research Centre of Finland), which is often used by energy policy makers. I do not wish to cast doubts on the expertise found in the VTT. I question, however, the way Finnish policy has latched onto the numbers given in the Background report, which were presumably never intended to be interpreted as more than a suggestion, much less a maximum attainable level. The 500 MW target remained the same from 1999 onwards, despite the changes in wind power technology, energy markets, etc. Only in 2005 did there emerge a change when the target was lowered, as will be discussed later.

As Sawin (2001: 385, 422, 432) has noted, the problem with low targets is they give a negative signal to potential investors (see Section 4.3.5), and can sometimes be seen as the upper limit. This seems most likely in the case of a new sector in which national experience is largely lacking, such as wind power. It is also known that some predictions or estimates may become self-fulfilling prophecies (e.g., van Vught 1987), since images of the future influence decisions made today. For example, believing that wind power will not be economically competitive in 2025 affects views of whether wind power

should be promoted today. A very limited share of production, even in the future, possibly combined with the continuous need for subsidies obviously reduces the legitimacy of high targets and stringent wind power policy instruments.

Decision-makers in private companies are also unlikely to invest money, time, and effort on an energy form that they expect to be unable to stand on its own, even after several decades. On the other hand, believing that wind power can be a significant player in the Finnish electricity sector is likely to encourage investments in it, in order to gain expertise and the first-mover advantage.

Are we constricted in our thinking by the official Finnish wind power targets, or are they an inspiring goal, an almost unattainable level? Both views were expressed in the interviews, and the question cannot yet be answered conclusively. In any case, the target of 500 MW of installed capacity by the year 2010 was considered very significant. It was often assumed that since the state is committed to this target, it would somehow find the means of reaching it (I). Interestingly, this target was thought to bind future governments as well, whereas long-term commitment to particular policy instruments could not be expected.

However, there have been signs of fading faith of Finnish policy makers. The recent *National energy and climate strategy* (Government 2005) no longer mentions the 500 MW target. Instead, it gives as the target a 10% yearly growth of wind power and several other renewable energy sources for the years 2005-2015. This would signify only approximately 130 MW of wind power capacity in the year 2010.

### **7.3 Motives and objectives of Finnish wind power policy**

In official documents about Finland's wind power objectives (MTI 1999a; 2003), the struggle against climate change has provided the primary motive for wind power policy and development in Finland. Nearly all interviewees considered wind power's positive climate impact to be self-evident.

The situation is not very different from other countries: Szarka (2004) has noted that, of the many potential environmental and energy security benefits of wind power, European wind lobbies emphasise climate change. He attributes this emphasis to climate change's being a successful discourse with considerable public and media support. Tirkkonen (2000: 14-16, 79) identified the reduction of carbon emissions through policy means, particularly the internationally binding Kyoto Protocol, as a hegemonic climate discourse.

In Finland, state actors generally see renewable energy forms as important in reaching the climate targets. However, wind power does not have a very high priority, and biomass is expected to supply most of the increase of renewables in electricity supply (MTI 1999a; 2003).

The discourses about wind electricity in relation to the electricity system (Section 6.1.2) showed some doubts about the benefits of wind

electricity production: if wind power has a very small share of the electricity production, its environmental benefits will remain marginal. And if it continues to require preferential treatment or a specialised “green” electricity market that will not grow rapidly in Finland, then the economic rationality of using wind power to reach climate benefits is questionable. These doubts seem to be reflected in the relatively modest official wind power capacity target.

Another motive for supporting wind power could be its ability to increase energy security by reducing the need for imported energy. This benefit is valued internationally (in European Union documents, for example), but in Finnish discourse, it is not often mentioned. Few interviewees brought it up at all.

Possibly wind power is considered too marginal to be able to contribute much to energy security. Also, much attention has been paid to the difficulties intermittent electricity production may cause to the grids and to the need for reserve capacity, often assumed to be coal condense power<sup>17</sup>. In addition, wind power is also sometimes considered unsuitable for providing the constantly required base-load power (also Lammi 2004: 14). Nevertheless, it is surprising that this issue emerged so rarely, considering that Finland is highly dependent on imported energy; furthermore, reluctance to rely on Russian natural gas supply was a much-used argument for the increased use of nuclear power in the debate that raged at the time of the interviews that were conducted in 2002 (Lammi 2004: 29, 32, 42). In 2006, the European concern about Russian energy imports increased further, but I doubt that this will have any effect on the way wind power is regarded in Finland, because of other concerns about its potential.

The question of energy security has emerged perhaps more often in Parliamentary discussions than in the interviews, but mainly in the context of “domestic” or “renewable” energy rather than in connection with wind power specifically. The references have seemed to be more about biomass and peat (which is considered a very slowly renewing energy source) than about wind power.

The very positive image associated with the wind power technology and industry that emerged so strongly in the interviews has not been as clearly reflected in the official objectives of wind power policy. The first national wind power programme also included an industrial objective: “the maintenance and expansion of the favourable market situation of Finnish subcontract work in foreign deliveries, with support of technological development if necessary” (MTI 1993a: 16, my translation). Export opportunities continued to be mentioned in Finnish energy programmes and strategies (Government 1997; MTI 1999a; MTI 2003), but not always with such openly stated objectives. In addition, in the Action plans for renewable

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<sup>17</sup> The results reported by Holttinen (2004: 44-52, 73) show that some reserve capacity would be needed if the wind power penetration increased substantially, to several percent of peak capacity. However, the reserve requirements would increase only by a few percent of the wind power capacity.

energy development (MTI 1999a; MTI 2003) technological development has been seen as an important *means* of promoting the use of renewable energy sources.

The connection between industrial development and wind power policy seems clear, however. In the interviews this emerged as the so-called home market argument. The usefulness of home markets has sometimes been publicly challenged in Finland. For example, the CEO of *Pohjolan Voima*, a company that has both built wind power and contributed to turbine manufacture through a subsidiary company, stated that a small number of references suffices, and supporting exports will soon be history as a basis of wind power policy (Rajala 2004). For the most part, however, the importance of home markets has been referred to and emphasised by numerous Finnish actors, such as researchers (Holtinen *et al.* 2002), the wind turbine lobby (Virtanen 2005), and politicians (e.g., Lehtomäki 2004; Tynkkynen 2005). The argument has also been strengthened recently by a study of various countries' wind power policies and wind industries (Lewis and Wiser 2007).

When the Finnish State Audit Office (SAO 2003) criticised the wind power subsidies for their small environmental impact, it was the Minister of the Environment, Jan-Erik Enestam, who responded. He stated that the SAO had not understood the purpose of the subsidization, which at this stage is more a question of a technological subsidy than an environmental one (*Kymen Sanomat* 2004). Also a civil servant in the Ministry for Trade and Industry has expressed the view that, in the short run, support for wind power can be seen mainly as support for Finnish wind power technology (Anttonen 2005).

However, some effort has been made in the Ministry of Trade and Industry to separate wind electricity production from the turbine industry. In an answer to a written question from some Members of Parliament, the Minister of Trade and Industry Pekkarinen noted,

“Finnish wind power technology and export have developed favourably even with the current rate of erecting wind power plants in Finland. From this it is possible to conclude and estimate that the development of wind power technology does not necessarily require, for example, the building of 100 MW yearly, but even a slightly faster building rate than the current one might be sufficient. On the other hand, if we want to make wind power a significant energy production form, this would require the building of at least 100 MW a year. It is important to see the difference between the needs of the technological development and the needs of energy economy when discussing wind power building.” (Pekkarinen 2004, my translation).

It is somewhat questionable whether the Finnish industry has, in fact, developed favourably, when its share of the global market has fallen (see Section 5.2), and Leino *et al.* (2004) state that the development and testing of arctic innovations has not progressed well as turbines have not been built in

Lapland for years. Nevertheless, Mr. Pekkarinen's answer clearly contests the home market argument. Since his response also includes some rather disparaging comments about the significance of wind power in Finland, it seems to question the rationality of wind power capacity expansion in the country.

The turbine industry has become an ever more important and publicly acknowledged motive for wind power development. In the most recent *National energy and climate strategy* (Government 2005: 20), wind electricity was considered to have a low cost-effectiveness, and the Finnish technology development and export opportunities were given as the main motive for supporting wind power production in Finland.

This means that the climate benefits were expected to be achieved with means other than wind power. As noted, biomass is expected to contribute most to the increasing share of renewables in electricity supply (MTI 1999a; 2003; Government 2007). Nuclear power is also sometimes expected to assist significantly in reaching the Finnish climate targets. Biomass and nuclear power have strong supporters in Finnish society, such as the energy-intensive paper and pulp industry. The conflict between nuclear power and wind power emerged in Section 6.1.4, where it was noted that the lobbying for additional nuclear power capacity in Finland can cause the marginalisation of wind power.

Of course, the recent energy and climate strategy is only meant for short-term development, and it is possible that in the future wind power will also be expected to contribute to Finland's environmental targets. In any case, having several policy objectives makes it more difficult to design instruments that benefit all target areas (Tinbergen 1952; Varho 2004: 33-34). It might be difficult to promote wind power capacity and wind electricity production with the same policy instruments as used in supporting technology development and industry. It can be asked what the actual problem is that is being solved with wind power policy – a lack of renewable electricity or a need for a new industrial sector? In reality, both are likely to be part of the same “problem”, but the best solutions – including policy instruments – are not necessarily the same for both.

### **7.4 Policy instrument choices**

Some of the topics discussed above in this chapter influence policy instrument choice too or rather the stringency of instruments. For example, the assumed small wind power potential and lack of citizen support make coercive policy instruments less acceptable.

The interviewees approved the use of *RD&D funding* in Finnish wind power policy. The approval was explained by the wish to lower the costs of the technology in order to make wind power more competitive. Another explanation is the desire to help the Finnish turbine industry. In addition, technological progress in general was often given an intrinsic value and seen



as a central means through which Finland can retain competitiveness in the international markets.

Finnish wind power policy is based on *subsidies*, and the actors tended to consider them probable, although not necessarily preferable, for future use. The probability of subsidies and possibly also the favour they received can be explained partly by their long-standing use in energy policy. They were also thought to distort the market less than other measures and to allow the flexibility of policy that was valued by many actors.

Efforts to increase wind electricity through *consumer policies* are limited in Finland, consisting mainly of distribution of some general information regarding wind power and of an Internet-based service of electricity price comparisons. The interviewees did not have very much enthusiasm for consumer policies, in spite of the often-expressed view that consumers should direct the development of the energy sector. Finns were assumed to have a low environmental consciousness and were not expected to become active in the market. This view represents a significant change from the hopefulness and enthusiasm of the 1990s, when consumers were expected to start buying “green” electricity. The Environment Committee and many Members of Parliament, for example, called then for the establishment of a market for green electricity. They trusted that the demand would grow significantly and that also many companies would be interested in buying electricity with an environmental label for image reasons (YmVL 8/1997 vp; PTK 135/1997 vp).

As to the policy instruments that are not in use in Finland, the *feed-in tariff* was rejected by many wind power actors because it was thought to be expensive for the nation, inflexible, dictatorial, and in conflict with the idea of free markets. *Green electricity quota* was also objected to, on the grounds of being dictatorial, inflexible, and possibly in conflict with deregulation.

The “dictatorial” nature of these policies did not mean that they were unacceptable to all actors, however. Because of their perceived effectiveness, even less pleasant instruments were desirable to some. This seems to reflect the concepts of *input* and *output legitimacy* distinguished by van Kersbergen and van Waarden (2004). According to their definition, input legitimacy implies that the political system and specific policies are legitimised by the rules-of-the-game and the process that has produced them, whereas output legitimacy implies that the system and policies are legitimised by their success.

However, much of the discussion van Kersbergen and van Waarden (2004) reviewed to make this distinction, for example, quoting Thomassen and Schmitt (1999) and Scharpf (2001), concerns the European Union, European policy networks, and the Europeanization instead of individual policy instruments. For example, Thomassen and Schmitt (1999: 9) discuss legitimacy from the perspective of “the extent the political system is right” in the eyes of Europeans. Nevertheless, the concept of output legitimacy is quite useful and clarifying even in the case of specific policy instruments. It is the belief in the *output*, i.e., the effectiveness of the “dictatorial” policy

instruments in causing wind power growth that makes these instruments legitimate to some Finnish actors, even though they are seen to lack some legitimacy since they limit the free choice of market actors and dictate behaviour from above.

A great difference is in the way legitimacy other than output legitimacy is defined. Thomassen and Schmitt (1999) and Scharpf (2001), for example, consider the extent to which decisions are within the hands of political institutions that are answerable to a constituency. These authors see input legitimacy to be lacking in situations where the decision-making is dispersed and/or in the hands of non-elected actors. This is, of course, a rather opposite view to the interviewees' idea that policy instruments that increase the power of the state (and Parliament) over the market actors lack legitimacy. The interviewees' view seems to reflect the blending or confusion between the roles of a citizen and a consumer discussed above, or between representative democracy and free market in general, since it emphasises the role of the other market actors than consumers as well. It is not that the interviewees did not acknowledge the supreme authority of Parliament, but they considered deregulation and freedom of markets to be the prevailing political strategy and viewed the market as leading to an optimal situation better than any policy could.

I think that the interviewees trusted in the benefits of competition and were convinced that consumers and other market actors *should* direct wind power development by their preferences. According to Ruostetsaari (1998), the initiative for liberalisation of the electricity market came from the authorities, but the energy sector seems to have embraced the idea. The Finnish actors were not alone in this thinking; on the contrary, the International Energy Agency has described the approach "which favours minimal interference by governments in the operation of markets" as "the current political ethos" (IEA 2003: 16).

It seems that two of the Finnish energy policy targets pull in opposite directions, namely, deregulation and the opening of the electricity market, on the one hand, and increasing the share of renewable energy sources, on the other hand. It is hard to see how these two targets could both be reached in an optimal way at the same time. Increased government interference in the market may be necessary if the renewable energy goals are to be met. This is suggested by the fact that wind power capacity has grown most rapidly in countries with guaranteed price systems, although other factors have certainly contributed to the development.

### 7.4.1 The power and responsibility to transform electricity production

The views discussed above also reflect larger questions of power and responsibility in transforming the Finnish electricity production to a more sustainable direction. As noted, results regarding power relations were not very clear, except as they concerned views of consumer responsibility (III;

Section 6.3.3). Nevertheless, a few observations can be made regarding social power.

In the interviews and the questionnaire, wind power actors tended to name some or several other organisations more influential than their own organisation in wind power policy making and in wind power development. Some of these actors came from organisations that certainly appear very powerful from the outside. The comments may have followed from a Finnish ideal of modesty, as it is not considered appropriate to boast about your own influence. However, the actors may also have been trying to deflect the real power – and with it the real responsibility – to someone else.

As could be seen from the discussion in Section 6.3, some place the responsibility with the government, others with the consumers. The third set of actors here is the producers of wind electricity.

Since the liberalisation and deregulation of the electricity market, the state has not had much influence over individual investment decisions. Nuclear power is an exception, since permission to build a new power plant has to be obtained from Parliament. In general, the state can only make certain energy forms more attractive to investors, through subsidies or other policy measures. This puts emphasis on the importance of energy companies in the ecologisation of the electricity production structure.

Admittedly based on very small number of interviews by Salmela and myself (III), a following, simplified picture emerges: it seems that governmental actors place the responsibility on the electricity producers, whom they see as having the power in a liberalised and deregulated market. The electricity producers, however, expect consumers to direct investments through their preferences, because they hold the consumers to be the sovereign actors in the market. The consumers, in turn, often think that the state should take the responsibility, as they see themselves as relatively powerless, nor do they expect the electricity producers to take the responsibility. In reality, of course, some consumers as well as some political, administrative, and commercial decision makers take personal and/or professional responsibility for promoting wind power. Nevertheless, the conflicting views raise some interesting questions about the roles of the different actors, vis-à-vis the theory of governance.

Deregulation and market-based instruments have changed Finnish environmental and energy policy (Sairinen 2000; 2003). These changes are often seen as examples of the change taking place in policy steering from *government* to *governance* (e.g., Jordan *et al.* 2005). No single definition for governance exists, partly because the term has been used and defined in different ways in various scientific fields (van Kersbergen and van Waarden 2004). Certain aspects are usually acknowledged, however. The role and the ability of the state in directing society and its development is reduced when power has been transferred to supranational or global organisations, such as the EU or the World Trade Organisation, on the one hand, and to local and regional organisations, on the other. In addition, the number of different NGOs, interest groups, companies, and other groups has increased and they

form increasingly complex action networks. Consumers are an example of a new group of actors influencing energy reform, but they are unfamiliar with the role they have been thrust into and do not necessarily wish to assume the responsibility (Shove and Chappels 2001; Fuchs and Arentsen 2002).

In this transition towards governance and deregulated markets, social power is dispersed among many actors. Is it possible that at the same time the responsibility is distributed so widely that actors are able to ignore their own share? This issue seems to merit more study.

Another interesting question is whether this state of affairs will continue. Some actors were clearly frustrated with their inability to affect change. In literature, governance is sometimes described as a process where power is *taken* away from the state (e.g., Pierre and Peters 2000: 26), but in the case of the deregulation of the electricity market, it was clearly a case of giving power away. This does not change the fact that the relationships between actors have changed. As Rhodes (1997: 17) says: “the centre’s motives for getting rid of a function are not the point at issue. A function willingly lost is still a function lost; the centre can no longer do something it used to do”. But can the state take “the function” back?

Recently, calls for re-regulation have emerged – not in the context of renewable energy but as a response to various problems in the electricity market (e.g., Purasjoki 2006), which may in fact, have reduced the attention renewable energy is given. These problems include rising electricity prices caused by carbon emissions trading, the “windfalls” and the “undeserved” increase in their stock value that some companies (particularly those having a lot of hydropower) have received as a result of the rising prices, the consolidation of market power in a handful of companies, and the delivery problems in the Nordic market across national borders with the resulting extreme peak prices. The electricity production sector will presumably resist new regulation, however, and the outcome is far from clear. In addition, it is not known how any changes would affect wind power.

#### **7.4.2 The future of Finnish wind power policy instruments**

Although the theory of governance suggests that some power has been given to the international level, supranational organisations such as the European Union do not regulate renewable energy policies in a very detailed way. The EU has a great deal of influence on national environmental policies these days, but in energy policy, this influence has been relatively small (Sairinen and Lindholm 2004; Liefferink and Jordan 2005; Tews 2005). The EU has set binding targets, but often leaves their implementation and the choice of particular policy tools to the Member States.

Learning and co-operation between different countries seem to be largely lacking in regard to wind power policies. For example, although Finland and Sweden are part of the same electricity market, different renewable energy policy instruments are in use in Sweden (a green electricity

quota) and in Finland, and there has been little active co-operation regarding their harmonisation (Jenny Hedström, Swedish Energy Agency, personal communication, 20 June 2005). In general, Finland has not been a particularly active pioneer in environmental policy, although it has been among the forerunners (Andersen and Liefferink 1997; Sairinen and Lindholm 2004; Jänicke 2005).

Although the interviewees found both a feed-in tariff and a green certificate quota improbable, until the spring of 2006, I thought that that the latter was more likely to be introduced into Finland than the former. This view was based on remarks by Minister of Trade and Industry Mauri Pekkarinen (2005b), and a recent governmental report on the coordination of emissions trading, energy taxation, and energy subsidies, where feed-in tariffs were seen as incompatible with the open market and competition. No changes to the existing national system were proposed, although it was noted that the European trend is towards feed-in tariffs or certificate quotas (MTI 2004).

Therefore, I was astonished to discover that the Ministry of Trade and Industry had commissioned a report (Laurikka *et al.* 2006) on how the continued use of peat could be ensured using a feed-in tariff (MTI 2006). The threat to peat has come from the European carbon emission trade that has raised the costs of using peat. Usually a feed-in tariff is used to support renewable energy forms, but its use for peat could be legitimised by security of supply, peat being a domestic energy source. The report noted that although some laws regarding the electricity market would have to be changed in Finland if a feed-in tariff were introduced, no substantial barriers exist in either EU or national legislation (Laurikka *et al.* 2006). The motion to change legislation accordingly was taken to Parliament in autumn 2006 (Government 2006). The aim was to ensure the use of peat rather than coal in condensing power production during peak consumption.

The results of the above-mentioned study (Laurikka *et al.* 2006) and the very fact that the Ministry commissioned it seem to point to the possibility of also using feed-in tariffs in support of renewable energy forms in the future. When discussing the bill, both the Environment Committee and the Commerce Committee of Parliament also called for the government to explore this possibility (YmVL 35/2006 vp; TaVM 23/2006 vp). This view was shared and further endorsed by Members of Parliament in plenary sessions of Parliament when the bill was discussed and accepted in January 2007 (PTK 138/2006 vp; PTK 142/2006 vp).

However, studies of the issue have been called for and have also been conducted in the past, without any changes taking place in Finnish policy. In addition, this instrument met with resistance even in the case of the politically and regionally important peat, and I still find its use in the case of wind power quite uncertain. In any case, since the feed-in tariff for peat is only to be used until the year 2010 (when it is expected that the fifth nuclear reactor begins operation and reduces the need for other condensing power production), the feed-in tariff does not represent the kind of stability and

long-term trust in policies that seem to be so important for wind power development.

### ***7.5 Calm or storm – the future of Finnish wind power***

In Section 6.2, I presented several wind power scenarios. As noted, the scenarios are not to be used as predictions, but we may speculate on whether Finnish wind power seems to be following a “Calm” path or to be heading towards a veritable “Storm”.

In the year 2007, the Calm scenario seems to be closer to the mark: it seems unlikely that Finnish wind power capacity would reach the 500 MW that was set as the official target for the year 2010, although a relatively large number of wind power projects is being planned or constructed (Holtinen 2007). The policy is still based on investment subsidies, no offshore parks have been realised, and electricity consumption has continued to rise (the preliminary number from Statistics Finland [2007] for the year 2006 being 90 TWh). This is a far cry from the Storm scenario that represented ecological structural reform and in which wind power policy is based on mandatory green electricity quotas rather than subsidies.

The scenarios that included higher wind power capacities also included a strong political will to promote wind power and employed policy instruments other than investment subsidies. A scenario of this type cannot prove a direct causal link that would show that the investment subsidy is an ineffective tool. It is possible that if an actor did not believe in the potential of wind power in Finland, he considered investment subsidy to be a suitable form of support. The subsidy was otherwise valued, for example, for being relatively suitable for the deregulated market. On the other hand, if the actor trusted in the potential of wind power and hoped for rapid growth of installed capacity, he did not consider investment subsidy to be a reasonable policy tool, because sufficient funds are unlikely to be found in the state budget for large-scale wind power development. It would seem that the funds would have to be found from the market, in the form of feed-in tariffs, for example, if Finland is to break from the path envisioned in the Calm scenario.

In the Storm scenario, mandatory quotas for green electricity were envisioned. There is still relatively little experience in the performance of such schemes, but the European Commission (2005) has found feed-in tariffs to be the most effective tool currently in use for supporting wind power and possibly more cost-effective than green electricity quotas. Regardless of the chosen tool, the wind power actors often called for consistency and long-term security regarding future policies.

Although the Finnish wind power actors share the goal of increasing competitiveness of wind power, the best means to reach it is not agreed upon. That wind power is not very competitive in Finland is often blamed on the high costs of the technology. In the long run, of course, it can be expected that the technology becomes more competitive, and subsidies and other policies

can be eliminated. But how can the competitiveness be achieved most rapidly?

A particular distinction can be made in regard to “technology-push” and “market-pull” types of wind power policy instruments. In Finland, the technological change is expected to be achieved mainly through “technology push”, using research funding and support for pilot projects, for example, as well as granting investment subsidy only to projects that include some new innovation. Less attention is paid to the effects of increased use of wind power technology, i.e., “market pull”, but this mechanism also has its advocates. Thus, the two approaches in Finland can be summarised as follows: (1) improving technology will gradually lead to larger market penetration, and (2) larger markets, even if government-induced, will lead to improving technology and better competitiveness (Varho 2003b).

Innovation policy research could hopefully bring some solution to this “chicken and egg problem”, but it is probably not a question of either/or. A previous study of photovoltaics (Varho 2002) demonstrated that even the best technologies require cumulative experience and infrastructure for successful dissemination and sustainable use.

An energy company that invests in a completely new energy production form has to also invest in new knowledge, infrastructure, etc. At the same time, some of the considerable knowledge existing within a company and relating to existing energy forms may in fact be a hindrance. This means that a change is much more profound than a choice between two products of slightly different prices. The emphasis on product cost, (i.e., wind power technology) may be too strong if other barriers of product diffusion are not acknowledged.

Both better technology and larger markets are likely to follow in a virtuous circle if both are adequately funded. Emphasising only one aspect of development is not likely to lead to optimal results. The question of joint impacts of “learning by doing” and “learning by searching” has been studied, using the so-called two factor learning curves (2FLC), by Miketa and Schrattenholzer (2004), for example. Modelling the impacts of R&D funding and cumulative capacity growth could help to direct the government funds in an effective way, although the methodological problems remain significant.

Issues other than policies naturally affect investment choices greatly. For example, sufficient data on wind conditions in different parts of the country have long been lacking, although the new government has promised to address this issue (Government 2007: 40). Also, in Finland it is often particularly difficult to find suitable sites for larger wind power parks. In the Storm scenario, siting problems were decreasing, but so far there seems to be little evidence of such developments; rather the opposite seems to be the case. The best wind conditions are often on the coastline, where many competing land-use forms also concentrate. Siting conflicts may scare investors, or at least they delay, complicate, or reduce the size of projects. This happened recently in Pori when a number of summer cottage owners prevented the construction of three turbines (Pulkkinen 2006). Since small project sizes are

also a factor increasing project costs, locations would increasingly have to be found elsewhere than on the fragmented coastline. No experience yet exists on how offshore turbines can withstand the difficult ice conditions of Finnish waters.

It seems likely that for Finland to reach the numbers envisioned in the Storm scenario, offshore or inland locations must be taken into use, or (local) public opinion will have to become more positive towards installations at coastal locations. So far, Finnish companies do not seem to be actively taking advantage of the way local involvement and/or local ownership of turbines have been shown to increase the success of wind power projects (e.g., Toke 2002; 2005).

Another crucial issue for the future of wind power is the demand for wind electricity – or rather the lack of demand – since many wind power actors thought that only demand can create production. Unless demand-creating policy methods such as green certificate quotas are used, consumer interest must be induced. A rather general view among the interviewees seemed to be that Finnish consumers are not likely to become active in the wind electricity market. Considering the passivity of consumers so far, it seems unlikely that a change would take place overnight, although more aggressive advertisement and information campaigns might help.

Since households consume only a fifth of the electricity used in Finland and a fourth of the Finnish electricity already comes from renewable sources, it seems clear that enterprises and public organisations need to become active in the green electricity market, if consumers' purchases are to raise the share of renewable electricity in Finland. However, if the demand were for wind power specifically rather than for renewable electricity in general, much smaller demand would be enough to overtake the existing production and to inspire new investments in wind power.

Although Perrels and Lewis (2003) believed that business users could become buyers of green electricity, as they could reap economic benefits and reflect the company's ethics through such purchases, businesses have not started buying green electricity on a large scale in Finland. In fact, some of the largest consumers in Finland, such as the paper industry, have been found to marginalise the role of green electricity (Luukkanen 2003). Public consumers could also be encouraged to buy renewable electricity, and some have already made the switch.

The competition between different energy production forms continues, in the market as well as in the political arena. The share of biomass in energy production is high in Finland, and it continues to grow, whereas in the European Union the development of biomass use has been slower than expected and the progress of wind power quite rapid (European Commission 2004). It is likely that one important reason for the slow development of wind power in Finland has been the availability of considerable biomass resources and know-how as well as the important position the forest industry has in Finland. The corporate and knowledge cluster around biomass uses has perhaps concentrated the attention of both business and political decision



makers around biomass instead of wind power. The wind turbine industry cannot yet compete in the same league.

In addition, in some interviewees' experience, the nuclear power lobbying in the beginning of this decade made it harder to promote wind power. New difficulties are likely to emerge, since the debate about additional nuclear power has again intensified in Finland. The belittling and marginalising of wind power evident in the interviews may increase in the public debate. In addition, investing in nuclear power reduces the available resources a company has for other investments. The new Government Programme (Government 2007) seems to promise the opportunity to build new nuclear and/or hydropower plants in Finland.

Of course, there are likely to be other factors affecting wind power development that did not emerge in the interviews. For example, it has been suggested that the use of the so-called Mankala Principle (see Section 5.4.2) stiffens the electricity market, creates dual prices for electricity, and indirectly hinders the growth of renewable electricity production (Vehmas 2006). On the other hand, much of the Finnish wind power has been built under the Mankala Principle, which has allowed companies to pool their resources in order to increase project size, lowering the costs per wind turbine and countering the limited know-how each individual company is likely to have for wind power projects.

### **7.6 Finnish wind power and ecological modernisation**

It seems clear that so far wind power has not contributed very significantly to the ecological modernisation of the Finnish energy production sector. Wind power produces some 0.2% of the electricity consumed in Finland and therefore cannot lessen the environmental impact of energy production to any great degree<sup>18</sup>. Much more important have been the increased use of biomass, the high percentage of co-generation of heat and power (CHP) enabling efficient use of fuels, and the district heating networks in many cities and towns.

Finnish wind power technology and industry, on the other hand, have so far fared better. It seems that it is the industry that largely motivates many

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<sup>18</sup> Of course, the share of wind power is not necessarily a good measurement of ecological modernisation. The growing electricity consumption means that it is difficult to *reduce* the emissions from the electricity sector, even if wind power production's share of the total production grows. Szarka (2004), for example, believes that unless the wind sector can demonstrate actual *cuts* in (greenhouse gas) emissions from the energy sector and these take place as a direct effect of wind power expansion, the use of climate change as a foundation for wind power policy becomes questionable. True ecological modernisation clearly would require the reduction of absolute amounts of emissions. However, Szarka's view fails to take into consideration that even a small share of wind power offsets the building or use of other energy forms, or that the transition of the energy sector to a more environmentally friendly direction (to the new, environmentally sustainable Techno-Institutional Complex, as Unruh [2000] calls it) has to start somewhere.

wind power actors, and they see wind power as a new type of technology that creates both economic and environmental benefits. This understanding of the combined benefits has a far-reaching promise: if wind power is seen as both environmentally and economically sensible, it can diminish the suspicious or pessimistic attitudes towards environmentally sound technology or environmental protection in general. If wind power is perceived in the economy, not as an exception, but as an example of a new, environmentally and economically rational industry, then it may have a much more profound effect on the environment and society than any number of wind turbines. Such a view was surely one of the original ideas behind the theory of ecological modernisation.

As discussed in Chapter 1, wind power is often seen internationally as a prime example of ecological modernisation. In Finland, however, the “win-win” view of wind power as both an economically and environmentally sound activity is somewhat contested. In fact, environmental and economic interests in general were sometimes seen to be very far from one another. In addition, it should be noted that the economic rationale of wind power has largely depended on policies that promote its use. This dependence highlights the importance of governmental guidance in promoting ecological modernisation, which has been discussed by some theorists. For example, Andersen and Massa (2000) emphasise that ecological modernisation requires action on the part of government and businesses alike. In addition, Murphy and Gouldson (2000) note that regulation would need to establish the environment as a strategic concern of industries.

The costs of wind power policies cause resistance on the parts of many energy sector actors. Because these actors also have doubts about the potential and competitiveness of wind power in Finland, even in the long run, they are not likely to believe in a real win-win situation in regard to wind power.

In any case, it is clear that the future growth of wind electricity production in Finland will be crucial to whether wind power can contribute significantly to the ecological modernisation of the Finnish energy sector.

## 8 Conclusions

In this study I have described various discourses and perceptions of Finnish wind power actors regarding wind power, its future in Finland, and measures to promote it in Finland. I collected views of the various actors through interviews, a questionnaire and documents, analysed the various materials and presented the results, for example, through scenarios for which we developed a new method. In this way, I have made the actors' perceptions more visible and created a more multifaceted image of wind power discourses, future expectations regarding wind power, and views of suitable wind power policy. The actors base their decisions on these perceptions, and the decisions influence wind power policy and wind power development in Finland. Therefore, I have increased understanding about societal factors that have affected Finnish wind power, in accord with the research objective.

This does not mean that the work is finished. Instead, many fascinating questions remain. There is much more to be learned about such factors as the power relationships between various wind power actors, the relationship between Finnish innovation policy and wind power technology, and site selection and local conflicts. These questions have to be left for future research projects to address.

Although wind power has been seen as a prime example of ecological modernisation in international literature, the ecological modernisation of the Finnish energy sector has not benefited much from wind power. By comparison with wind power development in Europe, the Finnish targets are quite modest, and it seems that even they will not be reached. So far, the progress of wind power has followed most closely the scenario named "Calm", the scenario of the slowest wind power growth presented in this study. The share of wind power has remained so small that it changes the environmental impact of electricity production in Finland very little.

However, ecological modernisation of the energy sector can be substantially affected if wind power is seen as both economically and environmentally sensible. The wind turbine industry has become a new branch of Finnish industry, and as international markets grow this branch will likely continue to grow in Finland as well (although the dormant domestic market is often expected to hinder its progress). Nevertheless, a somewhat suspicious attitude towards wind power and also towards environmental protection could still be found in Finland. This was probably partly a result of the continuing conflicts between environmental organisations and energy producers, notably in regard to nuclear power and hydropower projects.

In addition, wind power has the potential to grow significantly, but reaching this potential and moving towards rapid growth seem to require changes in several societal factors.

One of the most important factors in the slow growth of wind power in Finland has perhaps been the pessimistic view of its potential. Discourse struggles and scenarios about the future of wind power demonstrated a

marginalising perception and disbelief about the possibilities and future of wind power in Finland. In such cases, wind power was not seen as a realistic form of energy production that can be taken seriously, but rather as small-scale puttering, with the most important benefit being a home market for the wind turbine industry. This attitude makes more understandable the reduced (and originally modest) targets in wind power policy, the limited interest in investing in wind power, and the choice of wind power policy instruments.

A concrete factor that contributes to an unwillingness to invest in wind power in Finland is quite simply its lack of profitability. In the current situation, the projects may not be taking a loss, but the uncertainty of future policies and the lack of demand by consumers do not encourage investments.

The price of electricity was generally expected to rise (as it has over the past years). The rising prices were expected to increase the competitiveness of wind power. Energy policies such as carbon emission trade that are not directly aimed at wind power may therefore support wind power more effectively than the actual wind power policy.

During the interviews (in 2002-2004), deregulation and free energy markets were considered a norm and the main strategy of the Finnish energy policy. In recent years, the calls for re-regulation have increased, but there are still few concrete policy changes. Some wind power actors regarded the current policies as suitable for the needs of wind power production. However, based on the slow growth, it seems that wind power requires more stringent policies than the subsidies currently used, but when defined as a marginal energy policy form, wind power does not legitimise deviations from deregulation. The limited consumer demand for wind electricity also reduces faith in wind power and the legitimacy of wind power policy, in particular because consumers are often interpreted as synonymous with citizens, and therefore the small market demand is seen as reflecting public opinion.

The results of consumer research suggest that consumer passivity can partly be explained by the shortcomings in knowledge relating to the market itself, by consumers' lack of experience in dealing in the market, and by consumers' belief that their own actions cannot change the electricity production structure.

Finnish wind power policy has largely been directed towards technological development. The methods in use include R&D funding as well as focusing the subsidies on projects that have pilot elements ("technology-push"). The assumption is that technological development will lower the costs of wind power and thereby allow larger market penetration. Policy tools that would affect the demand of wind power ("market-pull"), on the other hand, have not been much in use. A significant part of the policy tool arsenal has therefore been disregarded. International harmonisation of energy policy and new targets for renewable energy, particularly at the level of the European Union, may increase pressures to take new wind power policy tools into use in Finland.

The interviewees' opinions about the appropriateness of policy instruments were based both on process-oriented and on value-based criteria. National policy style seemed to explain a great deal about the choice of individual policy tools. The feed-in tariffs and green certificate quotas that are largely used in Europe were often considered unsuitable for Finnish energy policy. They were seen as inflexible and constraining, and it was considered problematic to bind future governments to specific policies. On the other hand, some actors favoured these policies for their stability and predictability, which are the counterparts of inflexibility.

Finnish wind power actors were often unwilling to interfere with the free market. Many interviewees thought the feed-in tariffs and green certificate quotas "dictatorial". Deregulation and market-based instruments were often appreciated for subjectively defined value-based criteria, such as justness and being in accord with western values.

On the whole, in Finnish wind power policy choices, it is the suitability of measures in Finland, flexibility, dynamic efficiency, and perhaps cost-effectiveness that have been valued more than the effectiveness in increasing wind electricity production. On the other hand, the choices have reflected a particular sub-objective of wind power policy: it is the development of technology (in order to allow market penetration) rather than the direct growth of market volume that has been the goal.

To a significant degree, what has been driving Finnish wind power policy is the wind turbine industry, although this is not always clearly stated in wind power programmes. While this motivation is internationally widespread, it may be particularly important in Finland. It is also one of the factors that make the emphasis on technological development understandable. Another is the high value that the Finnish (wind power) actors place on technological development in general.

However, the industry has also been used as a "tool" in advocating wind power construction in Finland, using the home market argumentation. This story line combines the economically lucrative and "serious" wind turbine export industry with the environmental benefits of wind electricity production. Such a story line helps to make support for wind electricity economically sensible. This argument has often been used, partly because environmental benefits alone have been considered insufficient in political debate. For wind electricity production, this story line has the risk of focusing policy on measures that particularly benefit the industry and of the possibility of this argument being contested as a justification for supporting wind power production. Recently, the idea that the current rate of wind power construction would be nearly enough for the needs of the turbine industry has been expressed.

The competition between different energy forms continues in Finland. Nuclear power lobbying was perhaps one reason for the marginalisation of wind power in discourse, and additional nuclear power plants are already being planned in Finland. In addition, Finnish experience, know-how, and resources lend themselves readily to the use of biomass, reducing the

attention wind power receives. Nuclear power, biomass, and hydropower are all forms of energy that share with wind power the potential to reduce fossil carbon emissions from the energy sector. They are also all lobbied for by referring to the employment opportunities they offer. The opportunity of investing in new hydropower and nuclear power projects can further reduce energy companies' interest in wind power projects.

It seems to me that faith in wind power has decreased in Finland since the beginning of the century. Certainly, other energy issues, including those related to the problems of the electricity market as well as the need to increase the share of biofuels in traffic have received much attention lately, possibly further reducing the attention to wind power.

The pessimistic view of wind power potential and development that seems to exist among some Finnish wind power actors may keep investments in wind power at a low level. This can, in the worst case, create a vicious cycle: small investments mean slow growth, which in turn feeds the pessimism and further reduces investments.

Relatively modest targets and continued reliance on flexible but non-permanent policies may also reduce investments. There can be another vicious cycle: with few investments in wind power, political faith in it will be reduced. This can lead to an even less ambitious policy, which will lessen investor faith and lead to fewer investments, and so on.

Of course, it is also possible that the Finnish wind power capacity will grow rapidly, particularly if policies are changed. Since a feed-in tariff has been approved for peat, there is a possibility that it will be taken into use to support wind power as well. Rapid wind power development has been seen in many countries. Certainly many factors supporting such growth exist. For example, Finland has a significant wind resource, particularly offshore. A number of new wind power projects are being planned or are under construction in Finland. Also, electricity consumption growth and pressures to reduce greenhouse gas emissions are likely to continue, increasing the need for more renewable and emission-free electricity production. Competing energy forms may face obstacles, because biomass, for example, is also needed for the forestry industry. Perhaps Finland has a "Storm" ahead after all.

## References

References have been listed in alphabetical order, regardless of the nature of the reference (scientific, popular, governmental document, etc.), in order to make finding the reference as easy as possible.

- Álvarez-Farizo, B. and Hanley, N. (2002) Using conjoint analysis to quantify public preferences over the environmental impacts of wind farms - An example from Spain, *Energy Policy* 30: 107-116.
- Amara, R. (1981) The futures field. Searching for definitions and boundaries, *The Futurist* 15(1): 25-29.
- Andersen, M.S. and Liefferink, D. (eds.) (1997) *European environmental policy - the pioneers*. Manchester University Press: Manchester.
- Andersen, M.S. and Massa I. (2000) Ecological modernization - origins, dilemmas and future directions, *Journal of Environmental Policy & Planning* 2: 337-345.
- Antila, H., Holttinen, E., Peltola, E., Lumijärvi, A. and Sipilä, O. (2005a) Tuulivoima-tiekartta viennin kehittämiseksi. Teknologiateollisuus.  
[http://www.teknologiateollisuus.fi/files/10397\\_tiekarttatuulivoima.pdf](http://www.teknologiateollisuus.fi/files/10397_tiekarttatuulivoima.pdf) (Jan 31, 2006).
- Antila, H., Holttinen, E., Peltola, E., Lumijärvi, A. and Sipilä, O. (2005b) Tuulivoima-tiekartta viennin kehittämiseksi, *Tuulensilmä* 16(4): 4-5.
- Anttonen, M. (2005) Energiatuen käyttö vuonna 2004 sekä vuoden 2005 näkymät, *Energiakatsaus* 1/2005: 17-19. Ministry for Trade and Industry: Helsinki.
- Arkesteijn, K. and Oerlemans, L. (2005) The early adoption of green power by Dutch households: An empirical exploration of factors influencing the early adoption of green electricity for domestic purposes, *Energy Policy* 33(2):183-196.
- Asko-Seljavaara, S., Saarikangas, M. and Tiuri, M. (2004) Tuulivoimala on kallis ja pilaa ympäristöä, *Talouselämä*, 9 March 2004. [http://www.talouselama.fi/doc.te?f\\_id=557936](http://www.talouselama.fi/doc.te?f_id=557936) (22 May 2006).
- Asko-Seljavaara, S. and Saarikangas, M. (2005) Written question KK 637/2005 regarding the siting and economy of wind power plants. 20 June 2005.
- Ball, T. (1988) *Transforming Political Discourse – Political Theory and Critical Conceptual History*. Basic Blackwell Ltd.: Oxford.
- Batley, S.L., Colbourne, D., Fleming, P.D. and Urwin, P. (2001) Citizen versus consumer: challenges in the UK green power market, *Energy Policy* 29(6): 479-487.
- Bell, D., Gray, T. and Haggett, C. (2005) The 'social gap' in wind farm siting decisions: explanations and policy responses, *Environmental Politics* 14(4): 460-477.
- Bell, W. (1997) *Foundations of Futures Studies: Human Science for a New Era*. Volume 1: History, Purposes, and Knowledge. Transaction Publishers: New Brunswick.
- Bogner, A. and Menz, W. (2001) *Expert knowledge and interaction: towards a methodology of the qualitative expert interview*, Paper presented to the 5<sup>th</sup> conference of the European Sociological Association (ESA), Helsinki, Finland, 28 Aug. – 1 Sept. 2001.
- Brand, K-W. (1997) Environmental consciousness and behaviour: The greening of lifestyles. In Redclift, M. and Woodgate, G. (eds.) *The International Handbook of Environmental Sociology*. Edward Elgar: Cheltenham, pp. 204-217.
- Brown, L.R., Renner, M. and Halweil, B. (eds.) (2000) *Vital Signs*. Earthscan: London.
- BTM Consult ApS (2002) International Wind energy development -world market update 2001 & Forecast 2002 through 2006.

## References

- BWE (Bundesverband WindEnergie e.V.) (2006) A clean issue – wind energy in Germany (written by Dr. Peter Ahmels, President of the German Wind Energy Association) <http://www.wind-energie.de/index.php?id=593> (2 Feb. 2006).
- Council of the European Union (2007) Presidency Conclusions – Brussels, 8/9 March 2007. 7224/1/07 REV 1. [http://www.consilium.europa.eu/ueDocs/cms\\_Data/docs/pressData/en/ec/93135.pdf](http://www.consilium.europa.eu/ueDocs/cms_Data/docs/pressData/en/ec/93135.pdf) (6 Sept. 2007)
- del Río, P. and Gual, M. (2004) The promotion of green electricity in Europe: present and future, *European Environment* 14(4): 219-234. DOI: 10.1002/eet.357
- Denzin, N.K. (1970) *The Research Act. A theoretical introduction to sociological methods*. Aldine Publishing Company: Chicago.
- Denzin, N.K. and Lincoln, Y.S. (1994) Introduction: Entering the field of qualitative research. In Denzin, N.K. and Lincoln, Y.S. (eds.) *Handbook of Qualitative Research*. Sage publications: Thousand Oaks, London and New Delhi, pp. 1-17.
- Department of Communications, Marine and Natural Resources (Ireland) (2006) Minister Noel Dempsey announces new initiative to increase production of electricity from renewable energy technologies. Press release 1 May 2006. <http://www.dcmnr.gov.ie/Press+Releases/Minister+Noel+Dempsey+announces+new+initiative+to+increase++production+of+electricity+from+renewable.htm> (5 Dec. 2006)
- Desholm, M. and Kahlert, J. (2005) Avian collision risk at an offshore wind farm, *Biology Letters* 1(3): 296-298. doi:10.1098/rsbl.2005.0336
- Driesen, D.M. (2003) *The Economic Dynamics of Environmental Law*. The MIT Press: Cambridge, Massachusetts.
- Dryzek, J.S. (1997) *The Politics of the Earth. Environmental Discourses*. Oxford University Press: Oxford.
- DTI (Department of Trade and Industry UK) (2000) *New and renewable energy: prospects for the 21st century*. London.
- Dye, T.R. (1992) *Understanding public policy*. 7<sup>th</sup> edition. Prentice Hall: Englewood Cliffs, New Jersey.
- EMA (Energy Market Authority) (2003) Sähköntuotannon vaihtaminen helpommaksi, press release 28 Aug. 2003. <http://www.energiamarkkinavirasto.fi/data.asp?articleid=491&pgid=144> (27 Sept. 2004).
- Eskola, J. and Suoranta, J. (1999) *Johdatus laadulliseen tutkimukseen*. 3<sup>rd</sup> edition. Vastapaino: Tampere.
- EU Directive 2001/77/EC of the European Parliament and the Council of 27 September 2001 on the promotion of electricity produced from renewable energy sources in the internal electricity market.
- EU Directive 2003/54/EC of the European Parliament and of the Council of 26 June 2003 concerning common rules for the internal market in electricity and repealing Directive 96/92/EC.
- EU Directive 2003/87/EC of the European Parliament and of the Council of 13 October 2003 establishing a scheme for greenhouse gas emission allowance trading within the Community and amending Council Directive 96/61/EC.
- European Commission (2000) Green paper: Towards a European strategy for the security of energy supply. COM(2000) 769 Final.
- European Commission (2004) Communication from the Commission to the Council and the European Parliament “The share of renewable energy in the EU”. COM(2004) 366 final. [http://europa.eu.int/comm/energy/res/legislation/country\\_profiles/com\\_2004\\_366\\_en.pdf](http://europa.eu.int/comm/energy/res/legislation/country_profiles/com_2004_366_en.pdf) (February 10, 2006).



## References

- European Commission (2005) Communication from the Commission. The support of electricity from renewable energy sources. COM(2005) 627 final.
- European Commission (2006) Green paper: A European Strategy for Sustainable, Competitive and Secure Energy. COM(2006) 105 Final.
- Eurostat (Statistical Office of the European Communities) (2006) Wind power capacity statistics, accessed 10 May 2006.  
[http://epp.eurostat.cec.eu.int/portal/page?\\_pageid=0,1136239,0\\_45571447&\\_dad=portal&\\_schema=PORTAL](http://epp.eurostat.cec.eu.int/portal/page?_pageid=0,1136239,0_45571447&_dad=portal&_schema=PORTAL)
- Eurostat (Statistical Office of the European Communities) (2007) Wind power capacity statistic, electricity production and consumption statistics, accessed 11 June 2007.  
[http://epp.eurostat.cec.eu.int/portal/page?\\_pageid=0,1136239,0\\_45571447&\\_dad=portal&\\_schema=PORTAL](http://epp.eurostat.cec.eu.int/portal/page?_pageid=0,1136239,0_45571447&_dad=portal&_schema=PORTAL)
- EWEA (European Wind Energy Association) (2003) Wind power targets for Europe: 75,000 MW by 2010. Briefing, October 2003.  
[http://www.ewea.org/fileadmin/ewea\\_documents/documents/publications/75GW/13190\\_policy\\_briefing\\_4\\_01.pdf](http://www.ewea.org/fileadmin/ewea_documents/documents/publications/75GW/13190_policy_briefing_4_01.pdf) (7 March 2006).
- EWEA (European Wind Energy Association) (2006) European Capacity Map.  
[http://www.ewea.org/fileadmin/ewea\\_documents/documents/publications/statistics/2005\\_statistics.pdf](http://www.ewea.org/fileadmin/ewea_documents/documents/publications/statistics/2005_statistics.pdf) (20 Feb. 2006).
- FANC (Finnish Association for Nature Conservation) (2005a) Sales statistics.  
<http://www.ekoenergia.info/ekoenergia/myyntitilasto/> (20 Feb. 2006).
- FANC (Finnish Association for Nature Conservation) (2005b) The Nordic sales of Bra Miljöval and Norppa electricity has increased dramatically during the last years, and is expected to break the 10 TWh milestone in 2005. Press release 15 June 2005.  
<http://www.sll.fi/tiedotus/tiedotteet/pressreleases/ecoelect> (20 Feb. 2006).
- Finnish Customs (2003) *Foreign Trade 2002 Finnish Trade in Figures*. National Board of Customs Statistics Unit: Helsinki.
- Fuchs, D. and Arentsen, M. (2002) Green electricity in the market place: the policy challenge, *Energy Policy* 30(6): 525-538.
- Gipe, P. (1991) Wind energy comes of age, *Energy Policy* 19(8): 756-767.
- Glaser, B.G. and Strauss, A.L. (1967) *The Discovery of Grounded Theory: Strategies for Qualitative Research*. Aldine de Gruyter: New York.
- Golob, R. and Brus, E. (1993) *The Almanac of Renewable Energy*. 1st Edition. Henry Holt and Company, Inc.: New York.
- Government (1997) Suomen energiastrategia - Valtioneuvoston energiapoliittinen selonteko. VNS 5/1997 vp.
- Government (2001) National Climate Strategy Finland. Government Report to Parliament. Ministry of Trade and Industry, Publications 5/2001.
- Government (2005) Lähiajan energia- ja ilmastopolitiikan linjauksia – Kansallinen strategia Kioton sopimuksen toimeenpanemiseksi. Government Report to Parliament, 24 Nov. 2005.
- Government (2006) Hallituksen esitys Eduskunnalle polttoturpeen ja sillä tuotetun sähkön toimitusvarmuuden turvaamista koskevaksi lainsäädännöksi. HE 100/2006vp.
- Government (2007) Government Programme of Prime Minister Matti Vanhanen's second Cabinet. Prime Minister's Office, Finland.  
<http://www.valtioneuvosto.fi/hallitus/hallitusohjelma/pdf/en.pdf> (28 June 2007).
- Guillemette, M., Larsen, J.K. and Clausager, I. (1998) Impact assessment of an off-shore wind park on sea ducks. National Environmental Research Institute (Denmark). NERI Technical Report No. 227.

## References

- Guillemette, M., Larsen, J.K. and Clausager, I. (1999) Assessing the impact of the Tunø Knob wind park on sea ducks: the influence of food resources. National Environmental Research Institute (Denmark). NERI technical report No. 263.
- GWEC (Global Wind Energy Council) (2006) Record year for wind energy: Global wind power market increased by 40.5% in 2005. Press release 17 Feb. 2006. [http://www.gwec.net/uploads/media/06-02\\_PR\\_Global\\_Statistics\\_2005.pdf](http://www.gwec.net/uploads/media/06-02_PR_Global_Statistics_2005.pdf) (06 June 2006).
- Hadjilambrinos, C. (2000) Understanding technology choice in electricity industries: a comparative study of France and Denmark, *Energy Policy* 28(15): 1111-1126.
- Hadley, S.W. and Short W. (2001) Electricity sector analysis in the clean energy futures study, *Energy Policy* 29(14): 1285-1298.
- Haila, Y. (2001) Ympäristötiede. In Haila, Y. and Jokinen, P. (eds.) *Ympäristöpolitiikka: mikä ympäristö, kenen politiikka*. Vastapaino: Tampere, pp. 258-272.
- Hajer, M. (1995) *The politics of environmental discourse. Ecological modernization and the policy process*. Oxford University Press: New York.
- Hanley, N. and Nevin, C. (1999) Appraising renewable energy developments in remote communities: the case of the North Assynt Estate, Scotland, *Energy Policy* 27(9): 527-547.
- Hannigan, J. (1995) *Environmental Sociology. A Social Constructionist Perspective*. Routledge: London and New York.
- Hemmelskamp, J. (1999) Impacts of environmental policy - the example of wind industry. In Klemmer, P. (ed.) *Innovation and the Environment*. Analytica: Berlin, pp. 71-100.
- Hirsjärvi, S. and Hurme, H. (2001) *Tutkimushaastattelu. Teemahaastattelun teoria ja käytäntö*. Helsinki University Press: Helsinki.
- Holttinen, E. (1993) Laskentamalli aurinko- ja tuulisähkön tuotannon yleistymisen analysointiin. Uudet energiajärjestelmät tutkimusohjelma – NEMO, Loppuraportti EP-15895Q-02. Energia-Ekono: Espoo.
- Holttinen, E. (2001) Tuulivoiman mahdollisuudet Suomessa. Lausunto Synoptia Oy:lle 10 April 2001. Electrowatt-Ekono Oy.
- Holttinen H., Peltola E. and Tuhkanen S. (2002) Wind power in Finland - export prospects and emission reductions. In Soimakallio, S. and Savolainen, I. (eds.) *Technology and Climate Change CLIMTECH 1999-2002, Final report*. TEKES National Technology Agency, Technology Programme Report 14/2002. Tekes: Helsinki, pp. 5-16.
- Holttinen, H. (2004) *The impact of large scale wind power production on the Nordic electricity system*. Doctoral thesis. VTT Publications : 554, VTT Processes, Espoo. <http://virtual.vtt.fi/inf/pdf/publications/2004/P554.pdf> (19 April 2006).
- Holttinen, H. (2005a) Tuulivoiman tuotantotilastot. Vuosiraportti 2004. VTT Prosessit, Projektiraportti PRO2/P2034/05. [In Finnish, abstract in English] [http://virtual.vtt.fi/inf/julkaisut/muut/2004/Vuosiraportti\\_2004.pdf](http://virtual.vtt.fi/inf/julkaisut/muut/2004/Vuosiraportti_2004.pdf) (21 Feb. 2006).
- Holttinen, H. (2005b) Suomen tuulivoimaloiden kustannustehokkuus parantunut, *Tuulensilmä* 16(4):12-13.
- Holttinen, H. (2006) Tuulivoiman tuotantotilastot vuosiraportti 2005, VTT Working Papers 55. VTT, Espoo. <http://virtual.vtt.fi/inf/pdf/workingpapers/2006/W55.pdf> (28.06.2006).
- Holttinen, H. (2007) Wind power projects in Finland, updated in April 2007. [http://www.vtt.fi/liitetiedostot/cluster7\\_energia/Tuulivoimaloiden%20hankelista%20huhti%202007.pdf](http://www.vtt.fi/liitetiedostot/cluster7_energia/Tuulivoimaloiden%20hankelista%20huhti%202007.pdf) (9 Aug 2007).
- Honkatukia, J., Forsström, J. and Tamminen, E. (2003) *Energiaverotuksen asema EU:n laajuisen päästökaupan yhteydessä*. Government Institute for Economic Research, VATT Research reports 102, Helsinki.
- Howlett, M. and Ramesh, M. (1995) *Studying Public Policy: Policy cycles and Policy Subsystems*. Oxford University Press: Toronto.

## References

- Huber, J. (2000) Towards industrial ecology: sustainable development as a concept of ecological modernization, *Journal of Environmental Policy & Planning* 2: 269-285.
- Huber, J. (2004) *New Technologies and Environmental Innovation*. Edward Elgar Publishing: Cheltenham.
- Hukkinen, J. (2003) Teemahaastattelun käyttö tulevaisuuden tutkimuksessa. In Vapaavuori, M. and von Bruun, S. (eds.) *Miten tutkimme tulevaisuutta?* Second edition. Acta Futura Fennica 5. Finnish society for futures studies, pp. 186-198.
- Hyvärinen, M. (1991) Tampella: politiikka ja politiikan vastaisuus. In Isaksson, P. and Virkkala, S. (eds.) *Tampereen keskustan muutos ja Tampella*. Tampereen yliopiston ylioppilaskunta, Julkaisusarja 1/1991. Tampere, pp. 101-112.
- IEA (International Energy Agency) (2003) *Creating Markets for Energy Technologies*. International Energy Agency: Paris.
- Jansson, J.-M. (1985) *Politiikan teoria*. Fourth edition. Tammi: Helsinki.
- Jokinen, A., Juhila, K. and Suoninen, E. (2004) *Diskurssianalyysin aakkoset*. Third edition. Vastapaino: Tampere.
- Jordan, A., Wurzel, R. and Zito, A. (eds.) (2003) "New" Instruments of Environmental Governance?: National Experiences and Prospects, *Environmental Politics* 12(1) Special issue.
- Jordan, A., Wurzel, R.K.W. and Zito, A. (2005) The rise of 'new' policy instruments in comparative perspective: Has governance eclipsed government?, *Political Studies* 53: 477-496.
- Juhila, K. (1999) Kulttuurin jatkuvasti rakentuvat kehät. Tilanteisesta kulttuuriseen kontekstiin. In Jokinen, A., Juhila, K. and Suoninen, E. (eds.) *Diskurssianalyysi liikkeessä*. Vastapaino: Tampere, pp. 160-198.
- Jänicke, M. (1997) The political system's capacity for environmental policy. In Jänicke, M. and Weidner, H. (eds.) *National environmental policies - A comparative study of capacity-building*. UNU/WIDER. Springer: Berlin, pp. 1-24.
- Jänicke, M. (2005) Trend-setters in environmental policy: the character and role of pioneer countries, *European Environment* 15(2): 129-142. DOI: 10.1002/eet.375
- Järvelä, M. and Wilenius, M. (1996) *Ilmastoriski ja ympäristöpolitiikka*. Gaudeamus: Tampere.
- Karakainen, T. (2006) Eikä vielääkään tuulivoimaa. *Voima*, 9/2006: 22-23.
- Kaivo-oja, J., Malaska, P. and Rubin, A. (1997) Asiantuntijuus on osaamista, eettisyyttä ja kriittisyyttä, *Tiedepolitiikka* 22(2): 19-30.
- Kakkuri-Knuuttila, M.-L. and Halonen, I. (1998) Argumentaatioanalyysi ja hyvän argumentin ehdot. In Kakkuri-Knuuttila, M.-L. (ed.) *Argumentti ja kritiikki: Lukemisen, keskustelun ja vakuuttamisen taidot*. Gaudeamus: Helsinki, pp. 60-113.
- Kamp, L.M. (2002) *Learning in wind turbine development. A comparison between the Netherlands and Denmark*. Doctoral dissertation. Universiteit Utrecht, Faculteit Ruimtelijke Wetenschappen: Utrecht.
- Kamppinen, M., Malaska, P. and Kuusi, O. (2002) Tulevaisuuden tutkimuksen peruskäsitteet. In Kamppinen, M., Kuusi, O. and Söderlund, S. (eds.) *Tulevaisuudentutkimus. Perusteet ja sovellukset*. Suomalaisen kirjallisuuden seuran toimituksia 896: Helsinki, pp. 19-53.
- Kantola, I., Haverinen, R., and Peuhkuri, T. (1993) *Energiatietämys julkisessa keskustelussa - Raportti suomalaisen sanomalehdistön energiakirjoittelusta*. Helsingin yliopiston sosiaalipsykologian laitoksen energiajulkaisuja 8/1993. [Energy related cognizance in public debating. In Finnish, abstract in English.]
- Karjalainen, K. (1986) *Energiatalouden poliittinen ohjaus Suomessa*. Yhteiskuntatieteiden tutkimuslaitos, Tampereen yliopisto. Sarja B :43. Tampere.

## References

- Karjalainen, K. (1987) *Puolueiden energianäkemykset*. Yhteiskuntatieteiden tutkimuslaitos. Tampereen yliopisto. Sarja B :46. Tampere.
- Kiviluoma, J. and Holttinen, H. (2006) Impacts of wind power on energy balance of a hydro dominated power system. In *European Wind Power Conference 28.2.-3.3.2006 proceedings, business and policy track*. EWEA.
- Klaassen, G., Miketa, A., Larsen, K. and Sundqvist, T. (2005) The impact of R&D on innovation for wind energy in Denmark, Germany and the United Kingdom, *Ecological Economics* 54(2-3): 227-240.
- Koistinen, J. (2003) Tuulipuistojen linnustovaikutukset, *Tuulensilmä* 14(1): 10-11.
- Kojo, M. (ed.) (2004) *Ydinvoima, valta ja vastarinta*. Like: Helsinki
- Kok, W. (2004) Facing the challenge - The Lisbon strategy for growth and employment. Report from the High Level Group chaired by Wim Kok. European Communities: Luxembourg.
- Kollmuss, A. and Agyeman, J. (2002) Mind the gap: why do people act environmentally and what are the barriers to pro-environmental behavior? *Environmental Education Research* 8(3): 239-258.
- Kuusi, O. (1999) *Expertise in the Future Use of Generic Technologies - Epistemic and Methodological Considerations Concerning Delphi Studies*. Doctoral dissertation. VATT-research reports 59, Government Institute for Economic Research: Helsinki.
- Kuusi, O. (2003) Delfoi-menetelmä. In Vapaavuori, M. and von Bruun, S. (eds.) *Miten tutkimme tulevaisuutta?* 2<sup>nd</sup>, renewed edition. Acta Futura Fennica 5. Finnish Society for Futures Studies, pp. 134-144.
- Kuusi, O. and Kamppinen, M. (2002) Tulevaisuuden tekeminen. In Kamppinen, M., Kuusi, O. and Söderlund, S. (eds.) *Tulevaisuudentutkimus. Perusteet ja sovellukset*. Suomalaisen kirjallisuuden seuran toimituksia 896: Helsinki, pp. 117-170.
- Kyllönen, S. (2004) Ydinvoiman ilmastomuutos. In Kojo, M. (ed.) *Ydinvoima, valta ja vastarinta*. Like: Helsinki, pp. 51-85.
- Kymen Sanomat (2004) Ympäristöministeri Enestam puolustaa ympäristötukia, *Kymen Sanomat* 13 Jan. 2004, p. 5.
- Kääriäinen, S. (1994) Response of Minister of Trade and Industry to the written question KK123/1994 regarding the implementation of the programme for the promotion of wind power production. 5 April 1994.
- Laakso, T. and Holttinen, H. (2001) Tuulivoiman tuotantotilasto, *Tuulensilmä* 12(1): 12-13.
- Laakso, T. (2004) Tuulivoiman tuotantotilastot, vuosiraportti 2003. VTT Processes research report PRO2/5098/04. [In Finnish, abstract in English]  
<http://virtual.vtt.fi/tuulitilastot/vuosi%202003.pdf> (25 Jan. 2006)
- Lammi, H. (2004) Tarinat kovasta ytimeästä. In Kojo, M. (ed.) *Ydinvoima, valta ja vastarinta*. Like: Helsinki, pp. 11-50.
- Lappalainen, P. (1997) Aineistokeskeinen politiikan tutkimusprosessi. In Lappalainen, P. (ed.) *Politiikan paikat*. Studia Politica Tamperensis 2. Department of Political Science and International Relations, University of Tampere: Tampere, pp 80-104.
- Laurikka, H., Rantalaiho, T. and Alanen, J. (2006) Selvitys turvelauhdesähkön tuotannon turvaamisesta suhteessa kivihiililauhde- ja maakaasulauhdesähkään rajattua syöttötariffijärjestelmää käyttäen. Green Stream Network, Selvitys: HL-060228-P3280-004.
- Lehtomäki, P. (2004) Speech given at the Oulunsalo wind farm inauguration, 7 Jan. 2004.
- Leino, P., Lahtinen, P., Holttinen, E. and Lumijärvi, A. (2004) Tuulivoimatavoitteiden toteutumisenäkymät Suomessa. Selvitys kauppa- ja teollisuusministeriön toimeksiannosta. Electrowatt-Ekono: Espoo.  
[http://ktm.elinar.fi/ktm\\_jur/ktmjur.nsf/all/AD1B1CD9FED5BD05C2256F88004F7BAC/\\$file/tuulivoimaselvitys\\_2004.pdf](http://ktm.elinar.fi/ktm_jur/ktmjur.nsf/all/AD1B1CD9FED5BD05C2256F88004F7BAC/$file/tuulivoimaselvitys_2004.pdf) (30.06.2006).

## References

- Leiwo, M. and Pietikäinen, S. (1998) Kieli vuorovaikutuksen ja vallankäytön välineenä. In Palonen, K. and Summa, H. (eds.) *Pelkkää retoriikkaa: Tutkimuksen ja politiikan retoriikat*. Vastapaino: Tampere, pp. 85-108.
- Lewis J.I. and Wiser R.H. (2007) Fostering a renewable energy technology industry: An international comparison of wind industry policy support mechanisms. *Energy Policy* 35: 1844-1857.
- Liefferink, D. and Jordan, A. (2005) An 'Ever closer union' of national policy? The convergence of national environmental policy in the European Union, *European Environment* 15(2): 102-113.
- Linder, S. and Peters, G. (1989) Instruments of government: Perceptions and contexts, *Journal of Public Policy* 9(1): 35-58.
- Lovins, A.B. (1979) (copyright 1977) *Soft Energy Paths. Toward a Durable Peace*. Harper Colophon Books: New York.
- Luhmann, N. (1989) *Ecological communication*. Polity Press: Cambridge. Originally published in German as *Ökologische Kommunikation* by Westdeutscher Verlag (1986).
- Lumituuli (2001) Lumituuli Ltd. in brief. <http://www.lumituuli.fi/english.html> (31 Jan. 2006).
- Lundgren, K. (2002) *Ekologinen modernisaatio Helsingin Energiassa*. Master's thesis, University of Helsinki: Helsinki. Unpublished.
- Luukkanen, J. (2000) Green electricity and climate change: Equity and market endogenous governance. In Haukkala, V. (ed.) *Every Human has an Equal Right? – Equity Problems in Climate Policy and Politics*. Second edition, Department of Regional Studies and Environmental Policy of the University of Tampere: Tampere, pp. 183-203.
- Luukkanen, J. (2003) Green paper with green electricity? Greening strategies of Nordic pulp and paper industry, *Energy Policy* 31(7): 641-655.
- Malaska, P., Kantola I., and Kasanen, P. (eds.) (1989) *Riittääkö energia – riittääkö järki?* Gaudeamus: Helsinki.
- Massa, I. (ed.) (1982) *Energia, kulttuuri ja tulevaisuus*. Suomen antropologisen seuran toimituksia 10, Porvoo.
- Massa, I. (1995) Epävarman yhteiskunnan ympäristöpolitiikka. In Massa, I. and Rahkonen, O. (eds.) *Riskiyhteiskunnan talous. Suomen talouden ekologinen modernisaatio*. Gaudeamus: Helsinki, pp. 7-38.
- Massa, I. and Haverinen, R. (2001) Arkielämän ympäristöpolitiikkaa – esitutkimus. *Suomen ympäristö* 521. Edita: Helsinki.
- Massa, I. and Ahonen, S. (2006) Mitä on arkielämän ympäristöpolitiikka. In Massa, I. and Ahonen, S. (eds.) *Arkielämän ympäristöpolitiikka*. Gaudeamus: Helsinki, pp. 9-16.
- McDonald, A. and Schrattenholzer, L. (2001) Learning rates for energy technologies, *Energy Policy* 29(4): 255-261.
- McGowan, J.G. and Connors, S.R. (2000) Windpower: a turn of the century review, *Annual Review of Energy and the Environment* 25:147-197.
- Michaelowa A. (2005) The German wind energy lobby: How to promote costly technological change successfully, *European Environment* 15(3): 192-199. DOI: 10.1002/eet.382
- Miketa, A. and Schrattenholzer, L. (2004) Experiments with a methodology to model the role of R&D expenditures in energy technology learning processes: first results. *Energy Policy* 32(15): 1679-1692.
- Ministry of the Environment, Lapin liitto, Pohjois-Pohjanmaan liitto, Keski-Pohjanmaan liitto, Pohjanmaan liitto, Sigma Konsultit, Electrowatt-Ekono (2003) Tuulivoimatuotannolle soveltuvat alueet Merenkurkun-Perämeren rannikko- ja merialueella. <http://www.lapinliitto.fi/kaavoitus/tvselv.pdf> (2 July 2007).

## References

- Mol, A.P.J. and Spaargaren, G. (2000) Ecological modernisation theory in debate: a review, *Environmental Politics* 9(1): 17-49.
- Mol, A.P.J. (2003) *Globalization and Environmental Reform. The Ecological Modernization of the Global Economy*. MIT press: Cambridge and London.
- Morthorst, P.E. (2001) Interactions of a tradable green certificate market with a tradable permits market, *Energy Policy* 29(5): 345-353. doi:10.1016/S0301-4215(00)00133-6
- Morthorst, P.E. (2003) A green certificate market combined with a liberalised power market, *Energy Policy* 31(13): 1393-1402. doi:10.1016/S0301-4215(02)00198-2
- Motiva (1999) *Tuulivoiman projektiopas*. Motiva publication 5/1999. Helsinki.
- MTI (Ministry of Trade and Industry) (1993a) Tuulivoiman tuotannon edistämishjelma, työryhmän ehdotus. Kauppa- ja teollisuusministeriö Energiaosasto Mietintöjä :35. [Programme for the promotion of wind power production, proposal of a working group. Reports C:35. In Finnish, abstract in English]
- MTI (Ministry of Trade and Industry) (1993b) *NEMO - Uudet energiajärjestelmät ja –teknologiat. Energiatutkimusohjelman loppuraportti 1988-1993*. Kauppa- ja teollisuusministeriö Energiaosasto, Katsauksia B:150. [Nemo – Advanced energy systems and technologies Final report on the energy research program 1988-1992. Reviews B:150. In Finnish, abstract in English]
- MTI (Ministry of Trade and Industry) (1999a) Uusiutuvien energialähteiden edistämishjelma. Kauppa- ja teollisuusministeriön julkaisuja 4/1999. Helsinki, Edita. [Action plan for renewable energy sources. Ministry of Trade and Industry, Publications 4/1999. In Finnish, abstract in English].
- MTI (Ministry of Trade and Industry) (1999b) Uusiutuvien energialähteiden edistämishjelman taustaraportti. Kauppa- ja teollisuusministeriön julkaisuja 24/1999. Helsinki, Edita. [Background report for the action plan for renewable energy sources. Ministry of Trade and Industry, Studies and reports 24/1999. In Finnish, abstract in English].
- MTI (Ministry of Trade and Industry) (2003) Uusiutuvan energian edistämishjelma 2003-2006, työryhmän ehdotus. Kauppa- ja teollisuusministeriön työryhmä- ja toimikuntaraportteja, 5/2003. Helsinki, Edita. [Action plan for renewable energy 2003-2006, A working group proposal. Ministry of Trade and Industry, Ad hoc committee reports 5/2003. In Finnish, abstract in English].
- MTI (Ministry of Trade and Industry) (2004) EU:n päästökaupan, energiaverotuksen ja energiantuotannon tukien yhteensovittaminen. Työryhmän mietintö. KTM Julkaisuja 35/2004. [Coordination of Emissions Trading in the EU, Energy Taxation and Energy Production Aid. A Working Group Report. MTI Publications 35/2004. In Finnish, abstract in English.]
- MTI (Ministry of Trade and Industry) (2005) *Energiakatsaus [Energy review]* 4/2005.
- MTI (Ministry of Trade and Industry) (2006) Turpeenkäyttö lauhdutusvoiman tuotannossa voidaan turvata. Press release 033/2006, 2 March 2006. <http://www.ktm.fi/index.phtml?i=1529&s=674> (22 May 2006).
- Murphy, J. and Gouldson, A. (2000) Environmental policy and industrial innovation: integrating environment and economy through ecological modernisation, *Geoforum* 31(1): 33-44.
- Määttä, K. and Pulliainen, K. (2003) *Johdatus ympäristötaloustieteeseen*. Talentum: Helsinki.
- Nakićenović, N., Grübler, A. and McDonald, A. (eds.) (1998) *Global Energy Perspectives*. Cambridge University Press: Cambridge.
- Niiniluoto, I. (1984) *Johdatus tieteenfilosofiaan. Käsitteen- ja teorianmuodostus*. Otava: Helsinki.
- Niskasaari, M. (2002) Kallis tuulivoima, *Seura* 19/2002, pp. 12-14.

## References

- Nurmi, E. (2002) Finbio: Ydinvoima edistää bioenergiaa. *Helsingin Sanomat*, 15 May 2002, Economy section.
- Nurminen, L., Valkama, S. and Varho, V. (1996) Miten Suomen energia tuotetaan tulevaisuudessa? *Helsingin Sanomat*, 31 Aug. 1996, p. D2.
- Olivecrona, C. (1995) Wind energy in Denmark. In Gale, R., Barg, S. and Gillies, A. (eds.) *Green Budget Reform*. Earthscan Publications Limited and IISD (International Institute for Sustainable Development), pp. 55-67.
- Paldanius, J. (1992) *Kansalaisten osallistuminen energiapolitiikkaan*. Kuluttajatutkimuskeskus, Julkaisuja 11/92. [Citizen participation in energy policy. National Consumer Research Centre, Publications 11/92. In Finnish, abstract in English.]
- Palmroth, A. (2004) *Käännösten kautta kollektiiviin. Tuuliosuuskunnat toimijaverkkoina*. Doctoral dissertation. Jyväskylä studies in education psychology and social sciences 241. Jyväskylä University Printing House, Jyväskylä. [From Translation to Collective. Wind Turbine Cooperatives as Actor Networks. In Finnish, abstract in English] <http://selene.lib.jyu.fi:8080/vaitos/studies/studeduc/9513918254.pdf> (22 May 2006).
- Paloniemi, R. and Varho, V. (2006) Learning Within Local Environmental Policy Implementation. In Tani, S. (ed.) *Sustainable Development through Education - Proceedings of the International Conference on Environmental Education*. Helsinki, 14 June 2005. University of Helsinki, Department of Applied Sciences of Education, Research report 268: Helsinki, pp. 93-109.
- Pekkarinen, M. (2004) Response of Minister of Trade and Industry Mauri Pekkarinen to the written question KK 646/2004 regarding the construction of an offshore wind power park. 22 Sept. 2004.
- Pekkarinen, M. (2005a) Response of Minister of Trade and Industry Mauri Pekkarinen to the written question KK 681/2005 regarding the updating of the Finnish wind atlas. 1 Sept. 2005.
- Pekkarinen, M. (2005b) Speech given at a seminar of the Environment Committee of the Finnish Parliament, 18 March 2005.
- Pekonen, K. (1991) *Symbolinen modernissa politiikassa*. Nykykulttuurin tutkimusyksikön julkaisu 25, Jyväskylän yliopisto: Jyväskylä.
- Perrels, A. and Lewis, P. (2003) The resurgence of DSM and the role of branding in power markets. In *Proceedings of ECEEE (European Council for an Energy Efficient Economy) 2003 Summer Study conference*, St-Raphael, France.
- Pierre, J. and Peters, B.G. (2000) *Governance, Politics and the State*. Macmillan Press: Houndmills and London.
- Pineau, P.-O. and Hämäläinen, R.P. (2000) A perspective on the restructuring of the Finnish electricity market, *Energy Policy* 28 (3):181-192.
- PTK 135/1997 vp (1997) Minutes of the plenary session of the Parliament. 29 October 1997
- PTK 138/2006 vp (2007) Minutes of the plenary session of the Parliament. 9 January 2007.
- PTK 142/2006 vp (2007) Minutes of the plenary session of the Parliament. 16 January 2007.
- Pulkkinen, P. (2006) Tuulen suunta kääntyi taas. *Helsingin Sanomat*, 23 April 2006, pp. E1-E2.
- Purasjoki, M. (2006) Sähkön tukku- ja vähittäismarkkinoiden toimivuus. Selvitysmies Matti Purasjoen raportti. Ministry of Trade and Industry. [http://www.ktm.fi/files/16728/SAHKOMARKKINOIDEN\\_TOIMIVUUS.pdf](http://www.ktm.fi/files/16728/SAHKOMARKKINOIDEN_TOIMIVUUS.pdf) (6 June 2007).
- Rajala, T. (2004) Speech given at the seminar Suomalaisen energian päivä, 27 Feb. 2004.
- Rantanen, E. (2005) Kuudes ydinvoimala, tule tule jo, *Talouselämä* 14 Apr. 2005. [http://www.talouselama.fi/doc.te?f\\_id=714945](http://www.talouselama.fi/doc.te?f_id=714945) (22 May 2006).

## References

- Rhodes, R.A.W. (1997) *Understanding Governance. Policy Networks, Governance, Reflexivity and Accountability*. Open University Press: Maidenhead.
- Ruostetsaari, I. (1987) *Energiapolitiikka ja vaikuttajat*. Tampereen yliopisto, Poliitiikan tutkimuksen laitos, sarja B:67. Tampere.
- Ruostetsaari, I. (1988) *Puolueet ja energiapolitiikka*. Tampereen yliopisto, Poliitiikan tutkimuksen laitos. Tutkimuksia 99. Tampere.
- Ruostetsaari, I. (1989) *Energiapolitiikan määräytyminen: julkisten, kollektiivisten ja markkinaperusteisten toimijoiden asema Suomen energiasektorin politiikkaverkostossa*. Acta Universitatis Tamperensis. Ser. A ; vol. 278. Tampere.
- Ruostetsaari, I. (1998) *Energiapolitiikka käännekohdassa. Järjestöt ja yritykset vaikuttajina vapautuvilla energiemarkkinoilla*. Tampereen yliopisto, Poliitiikan tutkimuksen laitos, Julkaisuja 8 / 1998. Tampere.
- Saaristo, K. (2000) *Avoin asiantuntijuus*. Doctoral dissertation, University of Jyväskylä, Publications of the Research Centre for Contemporary Culture no. 66.
- Sagoff, M. (1988) *The Economy of the Earth: Philosophy, Law and the Environment*. Cambridge University Press: Cambridge.
- Sairinen, R. (1991) Johdatus yhteiskuntatieteelliseen energiatutkimukseen. In Massa I. and Sairinen R. (eds.) *Ympäristökysymys. Ympäristöuhkien haaste yhteiskunnalle*. Gaudeamus: Helsinki, pp. 115-141.
- Sairinen, R., Viinikainen, T., Kanninen, V. and Lindholm, A. (1999) *Suomen ympäristöpolitiikan tulevaisuuskuvat*. Gaudeamus: Tampere.
- Sairinen, R. (2000) *Regulatory Reform of Finnish Environmental Policy*. Doctoral dissertation. Centre for Urban and Regional Studies Publications, Helsinki University of Technology: Espoo.
- Sairinen, R. (2003) The politics of regulatory reform: 'New' environmental policy instruments in Finland, *Environmental Politics* 12(1): 73-92.
- Sairinen, R. and Lindholm, A. (2004) Finland – a realistic pragmatist. In Jordan, A. and Liefferink, D. (eds.) *Environmental policy in Europe – The Europeanization of national environmental policy*. Routledge: London.
- Salmela, S. (2004) Kuluttajat vihreän sähkön markkinoilla - tarkastelu ympäristövastuullisen käyttäytymisen esteistä. Master's thesis, University of Helsinki: Helsinki. Unpublished.
- Sandén, B. and Åstrand, K. (2005) *Sprinters versus long-distance runners: how does policy-made markets pick actors and technology winners?* Presented at the 7th Nordic Environmental Social Science Research Conference (NESS), 16 June 2005. Gothenburg, Sweden.
- SAO (State Audit Office) (2003) *Ympäristötukien vaikuttavuus – energiatuet ympäristönsuojelun välineenä*. Valtiontalouden tarkastusvirasto, tarkastuskertomus 66/2003. Helsinki.
- Sawin, J.L. (2001) *The role of government in the development and diffusion of renewable energy technologies: wind power in the United States, California, Denmark, and Germany 1970-2000*. Doctoral dissertation, Fletcher school of law and diplomacy: Medford.
- Scharpf, F.W. (2001) Notes toward a theory of multilevel governing in Europe, *Scandinavian Political Studies* 24(1): 1-26.
- Shove, E. and Chappells, H. (2001) Ordinary consumption and extraordinary relationship: utilities and their users. In Gronow, J. and Warde, A. (eds.) *Ordinary consumption*. Routledge: London and New York.
- Silveira, S. (ed.) (2001a) *Building Sustainable Energy Systems: Swedish Experiences*. Svensk Byggtjänst and Swedish National Energy Administration: Stockholm.



## References

- Silveira, S. (2001b) Towards the sustainability vision. In Silveira, S. (ed.) *Building Sustainable Energy Systems: Swedish Experiences*. Svensk Byggtjänst and Swedish National Energy Administration: Stockholm, pp. 531-548.
- Similä, J. (2002) Ympäristösääntely ja arvioinnin näkökulmat, *Oikeus* 31(2): 178-201.
- Simonis, U.E. (1994) Industrial restructuring in industrial countries. In Ayres, R.U. and Simonis, U.E. (eds.) *Industrial Metabolism: Restructuring for Sustainable Development*. Tokyo, United Nations University Press.
- Soimakallio, S. and Savolainen, I. (eds.) (2002) *Technology and Climate Change CLIMTECH 1999-2002, Final report*. TEKES National Technology Agency, Technology Programme Report 14/2002. Tekes: Helsinki.
- Spector, M. and Kitsuse, J.I. (1977) *Constructing Social Problems*. Cummings: Menlo Park, CA.
- Statistics Finland (2001) Finnish household budget survey, income distribution statistics. [www.stat.fi/tk/el/kulutustutkimus/kulutust\\_t1\\_1.html](http://www.stat.fi/tk/el/kulutustutkimus/kulutust_t1_1.html) (20 Feb. 2006).
- Statistics Finland (2004) Energy statistics 2003. Helsinki.
- Statistics Finland (2007) Taulukko 2. Sähkön hankinta ja kokonaiskulutus, GWh. [http://www.stat.fi/til/ehkh/2006/04/ehkh\\_2006\\_04\\_2007-03-14\\_tau\\_002.xls](http://www.stat.fi/til/ehkh/2006/04/ehkh_2006_04_2007-03-14_tau_002.xls) (27 June 2007).
- Strachan, P.A. (2005) Speech given at the 11th Annual International Sustainable Development Research Conference, Helsinki, 8 June 2005.
- Street, P. and Miles, I. (1996) Transition to alternative energy supply technologies - the case of windpower, *Energy Policy* 24(5): 413-425.
- Szarka, J. (2004) Wind power, discourse coalitions and climate change: breaking the stalemate?, *European Environment* 14(6): 317-330.
- Söderholm, P., Ek, K. and Pettersson, M. (2007). Wind power development in Sweden: Global policies and local obstacles, *Renewable & Sustainable Energy Reviews* 11(3):365-400.
- Söderlund, S. and Kuusi, O. (2002) Tulevaisuudentutkimuksen historia, nykytila ja tulevaisuus. In Kamppinen, M., Kuusi, O. and Söderlund, S. (eds.) *Tulevaisuudentutkimus. Perusteet ja sovellukset*. Suomalaisen kirjallisuuden seuran toimituksia 896: Helsinki, pp. 251-347.
- TaVM 23/2006 vp (2006) Talousvaliokunnan mietintö 23/2006 vp koskien asiaa HE 100/2006 vp Hallituksen esitys polttoturpeen ja sillä tuotetun sähkön toimitusvarmuuden turvaamista koskevaksi lainsäädännöksi.
- Tekes (Technology Development Centre of Finland) (1998) *Advanced Energy Systems and Technologies (NEMO 2) Final report 1993-1998*. NEMO-report 31. Tekes: Helsinki.
- Tews, K. (2005) The diffusion of environmental policy innovations: cornerstones of an analytical framework, *European Environment* 15(2): 63-79. DOI: 10.1002/eet.378
- Thomassen, J. and Schmitt, H. (1999) Political Representation and Legitimacy in the European Union. In Schmitt, H. and Thomassen, J. (eds.) *Political Representation and Legitimacy in the European Union*. Oxford University Press: Oxford, pp. 3-21.
- Tiihonen, S. (2000) *From Uniform Administration to Governance and Management of Diversity*. Ministry of Finance, Public management department. Research reports 3/00. Helsinki.
- Tikkanen, S. (2006) Ekologisen verouudistuksen ituja hallinnollis-poliittisella kentällä – Analyysi käsitteen määrittelystä, toimeenpanosta ja valintaan vaikuttavista tekijöistä. Licenciate thesis, Department of Social Policy, University of Helsinki. Unpublished.
- Tinbergen, J. (1952) *On the theory of economic policy*. Contributions to economic analysis 1. North-Holland Publishing company: Amsterdam.

## References

- Tirkkonen, J. (2000) *Ilmastopolitiikka ja ekologinen modernisaatio*. Doctoral dissertation, Acta Universitatis Tampereensis 781. Tampere. [In Finnish, abstract in English]
- Toke, D. (2002) Wind power in UK and Denmark: can rational choice help explain different outcomes?, *Environmental Politics* 11(4): 83-100.
- Toke, D. (2005) Explaining wind power planning outcomes: Some findings from a study in England and Wales, *Energy Policy* 33:1527–1539.
- Toke, D. and Strachan P.A. (2006) Ecological modernization and wind power in the UK. *European Environment*, 16(3): 155-166. DOI: 10.1002/eet.417
- Tuhkanen, S. and Pipatti, R. (1999) Uusiutuvien energialähteiden edistämishjelman ympäristövaikutusten arviointi. Kauppa- ja teollisuusministeriön julkaisuja 23/1999, Edita: Helsinki. [Environmental impact assessment of the action plan for renewable energy sources. Ministry of Trade and Industry, Studies and reports 23/1999. In Finnish, abstract in English.]
- Tuomi, J. and Sarajärvi, A. (2002) *Laadullinen tutkimus ja sisällönanalyysi*. Tammi: Helsinki.
- Turkulainen, T. (2000) Tuulivoimalan elinkaariarviointi. VTT Kemiantekniikka. IEE reports 01/00.
- Tuulivoimayhdistys (2006) Finnish Wind Power Association.  
[http://www.tuulivoimayhdistys.fi/index\\_en.htm](http://www.tuulivoimayhdistys.fi/index_en.htm) (25 Jan. 2006)
- Tynkkynen, O. (2005) Speech in the plenary session of Finnish Parliament 14. Dec. 2005, PTK 138/2005 vp.
- United Nations (1992) *United Nations Framework Convention on Climate Change*.  
<http://unfccc.int/resource/docs/convkp/conveng.pdf> (12 June 2007)
- United Nations (1998) *Kyoto Protocol to the United Nations Framework Convention on Climate Change*. <http://unfccc.int/resource/docs/convkp/kpeng.pdf> (8 June 2006)
- Unruh, G.C. (2000) Understanding carbon lock-in, *Energy Policy* 28(12): 817-830.
- Uusitalo, L. (1990) Consumer preferences for environmental quality and other social goals, *Journal of Consumer Policy* 13: 231-251.
- Uusitalo, L. (1991) Oma etu vai yhteinen hyvä? Ympäristötietoisuuden ja toiminnan ristiriita. In Massa, I. and Sairinen, R. (eds.) *Ympäristökysymys. Ympäristöuhkien haaste yhteiskunnalle*. Gaudeamus: Helsinki, pp. 24-48.
- van Kersbergen, K. and van Waarden, F. (2004) ‘Governance’ as a bridge between disciplines: Cross-disciplinary inspiration regarding shifts in governance and problems of governability, accountability and legitimacy, *European Journal of Political Research* 43: 143-171.
- van Vught, F.A. (1987) Pitfalls of forecasting. Fundamental problems for the methodology of forecasting from the philosophy of science, *Futures* 19(2): 184-196.
- Vapaavuori, M. and von Bruun, S. (eds.) (2003) *Miten tutkimme tulevaisuutta?* Second, renewed edition. Acta Futura Fennica 5. Finnish Society for Futures Studies.
- Varho, V. (2000) Photovoltaic Rural Electrification in Developing Countries: Sustainable Development? Master’s thesis, University of Helsinki: Helsinki. Unpublished.
- Varho, V. (2002) Environmental impact of photovoltaic electrification in rural areas, *Energy & Environment* 13(1): 81-104.
- Varho, V. (2003a) Global benefits, local costs? - Motives for the Finnish wind power policy. Paper presented at the 6<sup>th</sup> Nordic Conference on Environmental Social Sciences (NESS), Turku, 13 June 2003.
- Varho, V. (2003b) Long-term policy making and the uncertainty of technological development: Wind power policy in Finland. Presentation at the YHYS Conference 2003 “The problem-oriented nature of environmental social science: integrating knowledge with practices”, Tampere, 20 Nov. 2003.

## References

- Varho, V. (2004) *Wind power policy options in Finland: analysis of energy policy actor's views using regulation theory*. Interim Report IR-04-073, International Institute for Applied Systems Analysis (IIASA), Laxenburg.
- Vehmas, J. (2000) Equity implications of the electricity market reform in the Nordic countries. In Haukkala, V. (ed.) *Every Human has an Equal Right? – Equity Problems in Climate Policy and Politics*. Second edition, Department of Regional Studies and Environmental Policy of the University of Tampere: Tampere, pp. 155-181.
- Vehmas, J. (2002) *"Rahat Ruotsiin ja päästöt Tanskaan". Suomen ympäristöperusteisen energiaverotuksen rekonstituutio 1993-96*. Doctoral dissertation, Acta Universitatis Tamperensis 861, University of Tampere: Tampere. [In Finnish, an English summary.]
- Vehmas, J. (2006) The role of nuclear power in Finnish energy and climate policies. Presentation at the conference "Climate Protection, Energy Policies, and Wind Power Innovation Courses in Comparison", Salzburg, 31 Aug. 2006. <http://web.fu-berlin.de/ffu/veranstaltungen/salzburg2006/Vehmas.pdf> (22 Dec. 2006)
- Virtanen, J. (2005) Teknologiateollisuus ry:n Tuulivoima-alan toimittajien toimialaryhmän kannatohto kansallisen ilmastostrategian valmistelutyöhön, *Tuulensilmä* 16(3): 4-6.
- Walsh, M. (1997) Tuulivoimaloiden rakentamisen ja käytön vaikutuksista lintukantoihin Suomessa, *Tuulensilmä* 8(2): 12-13.
- Wiberg, M. and Koura, A. (1998) Kansanedustajat ovat kyselevinään ja ministerit ovat vastaavinaan. Parlamenttikysymysten logiikka. In Palonen, K. and Summa, H. (eds.) *Pelkkää retoriikkaa: Tutkimuksen ja politiikan retoriikat*. Vastapaino: Tampere, pp. 197-219.
- Wilenius, M. (1997) *Faust on wheels: conceptualizing modernization and global climate change*. Doctoral dissertation, The Finnish Society of Sciences and Letters and The Finnish Academy of Science and Letters, Commentationes scientiarum socialium: Helsinki.
- Willamo, R. (2005) *Kokonaisvaltainen lähestymistapa ympäristönsuojelutieteessä. Sisällön moniulotteisuus ympäristönsuojelijan haasteena*. Doctoral dissertation, Environmentalica Fennica 23. Department of biological and environmental sciences, University of Helsinki: Helsinki.
- Yin, R.K. (1994) *Case Study Research – Design and Methods*. Second edition. Applied social research methods series volume 5. SAGE Publications: Thousand Oaks, London, and New Delhi.
- YmVL 8/1997 vp. (1997) Ympäristövaliokunnan lausunto 8 liittyen asiaan VNS 5/1997 Suomen energiastrategia, Valtioneuvoston energiapoliittinen selonteko.
- YmVL 35/2006 vp (2006) Ympäristövaliokunnan lausunto 35/2006 vp koskien asiaa HE 100/2006 vp Hallituksen esitys polttoturpeen ja sillä tuotetun sähkön toimitusvarmuuden turvaamistakoskevaksi lainsäädännöksi.
- Åkerman, M. (2006) *Tiedon tuotannon käytännöt ja ympäristöpoliittinen toimijuus. Rajaamisen ja yhdistämisen politiikkaa*. Doctoral dissertation, Acta Universitatis Tamperensis 1139. Tampereen yliopistopaino Oy – Juvenes Print: Tampere. [Knowledge practices and agency in environmental politics. In Finnish, abstract in English.]

# Appendices

## Appendix 1: List of interviewees

Mika Anttonen	Ministry of Trade and Industry, 27 April 2004
Esa Holttinen	Electrowatt-Ekono (consultant), 29 May 2002
Hannele Holttinen	Technical Research Centre of Finland ( <i>VTT</i> ), 31 May 2002
Veli-Matti Jääskeläinen	WinWinD (turbine manufacturer), 11 June 2002
Jorma Keva	Ministry of the Environment, 1 July 2002
Aarne Koutaniemi	Lumituuli (wind power producer), 19 June 2002
Simo Kyllönen	Finnish Association for Nature Conservation ( <i>Suomen luonnonsuojeluliitto</i> ), 2 July 2003
Jerri Laine	Finnish Funding Agency for Technology and Innovation ( <i>Tekes</i> ), 7 June 2002
Ari Lampinen	University of Jyväskylä, 28 May 2002
Peter Lund	Helsinki University of Technology ( <i>TKK</i> ), 23 May 2002
Folke Malmgren	Finnish Wind Energy Association ( <i>Vindkraftföreningen</i> ), 6 June 2002
Timo Mäki	Hyötytuuli (wind power producer), 28 April 2004
Bernt Nordman	Finnish Society for Nature and Environment ( <i>Natur och Miljö</i> ), 6 May 2002
Jaakko Ojala	Ministry of the Environment, 15 August 2002
Mauno Oksanen	Vapo Energia (wind power producer), 27 May 2002
Leo Parkkonen	Ministry of Finance, 26 June 2002
Esa Peltola	Technical Research Centre of Finland ( <i>VTT</i> ), 14 June 2002
Jouni Punnonen	The Confederation of Finnish Industry and Employers ( <i>Teollisuus ja työnantajat</i> ), 31 May 2002
Gustav Tallqvist	Synoptia (agent of BONUS Energy turbines in Finland), 25 June 2002
Bengt Tammelin	Finnish Wind Power Association ( <i>Suomen tuulivoimayhdistys</i> ), 10 June 2002
Martti Tiuri	Member of Parliament, Chairman of the Committee for the Future, 17 June 2002
Pentti Tiusanen	Member of Parliament, Chairman of the Environment Committee, 24 May 2002
Harry Viheriävaara	Finnish Energy Industries Federation ( <i>Finergy</i> ), 12 June 2002
Sirkka Vilkamo	Ministry of Trade and Industry, 17 May 2002
Jyrki Virtanen	Metso Drives (producer of turbine components), 28 May 2002

### Interviewed abroad:

Jochen Twele	<i>Bundesverband WindEnergie e. V.</i> (German wind power association), 9 December 2002
Jenny Hedström	<i>Energimyndigheten</i> (Swedish Energy Agency), 20 June 2005

## ***Appendix 2: Questions for the interviews***

### **BACKGROUND**

Your name, education and work tasks?

Do you belong to any (other) interest groups related to wind power, such as wind power associations?

How long have you been involved with wind power, and how did you get involved, was it perhaps coincidence or own inclination?

Was it difficult to distinguish between the probable and preferable futures (how did you define them?)?

### **GENERAL QUESTIONS**

We will return to the questionnaire later, but first I would like to discuss wind power policy, its direction and importance etc., on a more general level. This section is not as strictly tied to certain years or even to future in general. Instead, the objective is to understand your personal views about wind power, what you consider important and desirable, what not, and why.

- **Own action and preferences**

What does wind power represent to you, what kinds of benefits, harms, values?

How do you try to affect wind power policy and the development of the wind power sector?

- **Information / knowledge**

Is there enough information about wind power (sufficient information, in a suitable form, easily accessible, reliable)? What kind of changes do you foresee?

Is there anything special about the production and use of this information?

- **Political development**

What should wind power policy be like? What should be added or removed?

Will such an ideal situation be reached at some point? When / Why not?

Who should participate in the design of wind power policy in Finland?

## **QUESTIONS RELATED TO THE QUESTIONNAIRE**

### **Policy instruments**

If you needed to prioritise, which of these instruments would you consider most effective or efficient? Or in other ways most acceptable?

Are there still more policy instruments, which are not listed here (question 12), but which you would like to see in use?

### **Policy actors**

Would you please go over this list (question 13) and explain how you see the roles of these different actors, and the changes in the roles? Are there actors missing from this list?

Does wind power development threaten the interests of some group, or is it a win-win situation?

Who do you co-operate now or think you might co-operate with in the future? Or who would you like to work with, even though you do not consider it very probable? What kinds of forms could this co-operation take?

### **• Development of wind power in Finland**

What is the role of wind power policy in the development of wind power in Finland?

What other factors affect wind power development? How?

What kind of sudden events could have an impact, in addition to the trends? (Does the nuclear power decision have an impact?)

Who has the responsibility for developing wind power in Finland?

### **Green electricity**

Would it be desirable to sell wind electricity as green electricity?

Buying green electricity voluntarily has been slow so far. Can the situation be changed and should there be an attempt to do so? Who should make the effort and how?

Will some kind of certificate trading or green electricity quotas change wind electricity market?

Will wind electricity be successful in the green electricity market, despite of being, at least currently, more expensive than e.g. electricity from wood products?

Will green electricity be sold only to private consumers, or will also companies pay more for green electricity in the future?

Will the use of green electricity become a marketing tool for companies?

Do you believe that the consumers of electricity have some other role in the increase of wind power in Finland?

### **Limitations caused by siting issues**

How could we reach the preferable future?

Do you personally think that turbines fit into the Finnish landscape? Where would you like to (or not like to) install them (offshore – onshore, built environment – out of sight, coast – fells – inland)? Where would the wind parks be (geographical sites)?

- **Technological-economic development**

### **Wind power capacity**

How much wind power will there be in the future, and why?

How to reach the preferable future? Is there a limit of the total capacity in Finland, and what is it caused by?

### **Electricity consumption and GDP**

How will the electricity consumption develop in Finland, and why?

What assumptions are behind the figures on economic growth?

How will the electricity intensity of the economy develop? Will this require policy?

- **The development of the Finnish energy sector**

What impacts would the development of wind power have for the Finnish energy sector? (Changes in power relations between companies, in company strategies, in marketing, and in the power relations in the sector's decision making?)

Are some of these changes a precondition for wind power development, rather than its consequence?

### **The economic efficiency of wind electricity**

What would be a competitive production cost for wind power (and what are the current costs)?

Will the costs of other electricity production forms change at the same time? To what direction? What is the role of policy in this?

Are financial subsidies justifiable still in 2025, for example?

### **Wind electricity producers**

Which type of companies would be the most important wind power producers? Why? Will the companies continue to be Finnish, or will they be foreign? Will the companies that currently own wind power also be strong in the future?

### **Finnish turbine manufacturers**

What is the significance of the component and turbine industry to the building of wind power in Finland. What about the importance of building wind power in Finland to the industry?

Do Finnish companies that build wind power favour Finnish turbines?

Can there be more than one producer of big turbines in Finland?

### **Offshore**

How large will the offshore parks be? Where will they be situated? How soon?

What significance would offshore building have for wind power development? For example, how will the costs develop offshore and onshore?

### **Technological development**

How do you foresee the technology to develop in the future? Will the basic model (three blades, horizontal axis) remain?

Who is responsible for the technological changes: companies, research facilities, or somebody else? What is the role of wind power policy in this? Will the development take place in Finland or elsewhere?

### **FINAL QUESTIONS**

Can you recommend suitable persons in Finland for further interviews?

How would you characterise yourself, in relation to wind power: are you more an optimist or a pessimist?

Is there something else you would like to say? Any comments about the interview, its content or method? Some wishes regarding the study?



### ***Appendix 3: Questionnaire<sup>19</sup>***

#### Images about future

The purpose is to create two images about future (probable and preferable) for the years 2010 and 2025. Creating images about future is done by answering the following questions. I hope that you will write briefly next to your answers which assumptions and views your answer is based upon, and why the probable and preferable model may be different. The reasons will be discussed more thoroughly in the interviews, and it will also be possible to change or specify your answers at that time.

As experts from very different fields will participate in the study, the questions approach wind power from many points of view. If some part of the questionnaire seems difficult to answer to, you may leave that part empty and we can return to it in the interview. I hope, nevertheless, that you will try to answer as many questions as possible.

The objective of this study is not to create a single image about the future, i.e. a prediction. Instead, the attempt is to find possible development paths, factors leading to them, and their consequences. The aim is to understand, by studying experts' different views, what kind of factors influence the future of wind power, in what way, and why different experts see the future in different ways. It is a question of the experts' personal views, and not the official opinion of the organisations.

Probable image about the future refers to your personal view about what the situation will be like for wind power in the years 2010 and 2025. Preferable image about the future, on the other hand, is your personal view about what the situation hopefully will be like for wind power in the years 2010 and 2025. Both the probable and the preferable image about the future should be possible economically, technically and socially. In the preferable model it is possible to move away from the probable to the direction of the respondent's personal wishes. It may be improbable but not impossible to accomplish, in your opinion. The image about the future should also be internally coherent, i.e. different questions should not be considered separately.

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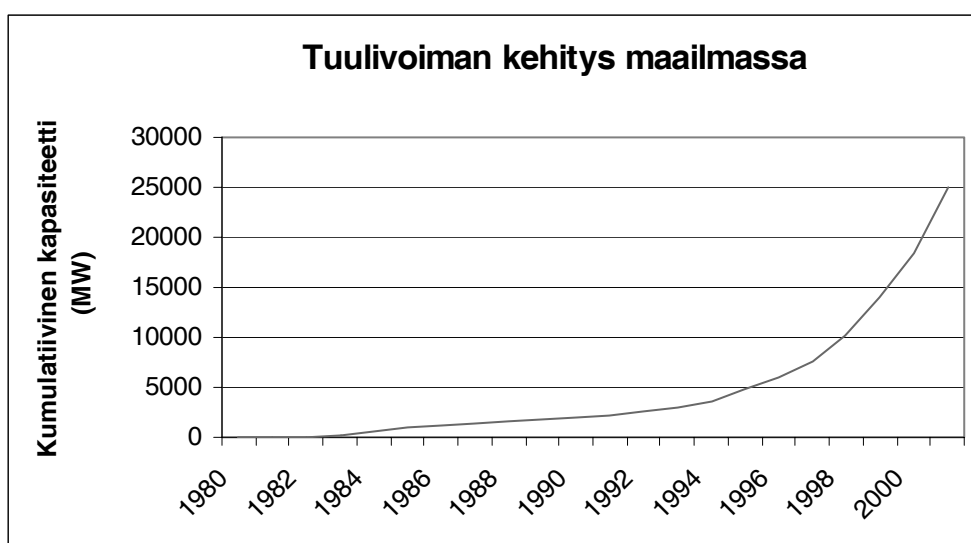
<sup>19</sup> The questionnaire has been translated from Finnish to English, and the number of lines provided for written answers have been reduced in order to conserve space, but otherwise the questionnaire looks identical to the one given to the respondents.

## The future of wind power in Finland

questionnaire number

1. Wind power has been taken to use in rapidly escalating pace in the world (during the years 1997–2001 the capacity grew in the average of some 33% in a year). Building has concentrated in Europe in particular to Germany, Spain and Denmark, elsewhere e.g., in United States and India. Over 80 percent of the world's capacity had been built to these countries by the year 2001.

(Data for years 1980–1995: Vital Signs 2000, for years 1996–2001: BTM Consult)



Please estimate how large a capacity has been erected in Finland (nominal power, as megawatts (MW))?

Realised development			Probable future		Preferable future	
1980	1990	2000	2010	2025	2010	2025
0	0,3	40				

Please state which assumptions and views your answer is based upon:

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2. How much electricity does the above-mentioned capacity produce (as gigawatt-hours, GWh)?

Realised development			Probable future		Preferable future	
1980	1990	2000	2010	2025	2010	2025
0	0,5*	77				

\* Estimate, based on the capacity of the years 1990 and 1992 as well as the electricity production of the year 1992, *Tuulensilmä* 3/2001.

Please state which assumptions and views your answer is based upon:

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3. How much is the whole electricity consumption in Finland (as terawatt-hours, TWh)?

Realised development			Probable future		Preferable future	
1980	1990	2000	2010	2025	2010	2025
40	60	80				

Please state which assumptions and views your answer is based upon:

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4. How will the national economy of Finland change in the future?

Due to the changes in the value of currency, it is not reasonable to compare the gross national product between different years as marks. Therefore, based on figures from Statistics Finland, here an index is used, in which the GNP of the year 2000 is represented by the number 80. Accordingly, the doubling of the economy from the year 2000, for example, would result in the index value 160.

Realised development			Probable future		Preferable future	
1980	1990	2000	2010	2025	2010	2025
48	65	80				

Please state which assumptions and views your answer is based upon:

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5. What kind of companies or communities are the most significant wind power producers in Finland (one tick per column)?

	Probable future		Preferable future	
	2010	2025	2010	2025
Small companies, specialised in wind power				
Large companies, specialised in wind power				
Large companies in which wind power is only one part of energy production				
Co-operatives				
Something else				

Please state which assumptions and views your answer is based upon:

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6. The first wind turbine of a Finnish producer was erected in the year 2001 and mass production of turbines is planned to be started in the summer of 2002.

How large a share of the turbines to be erected in Finland will come from Finnish producers (as a percentage)?

Probable future		Preferable future	
2010	2025	2010	2025

Please state which assumptions and views your answer is based upon:

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7. Building wind turbines to shallow seas has been tried in the world, but there are not these so-called offshore-turbines in Finland yet.

How much wind power has been built to sea i.e. to the so-called offshore-parks in Finland (nominal capacity as megawatts (MW))?

Probable future		Preferable future	
2010	2025	2010	2025

Please state which assumptions and views your answer is based upon:

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8. What changes will there be to wind turbines that are in commercial use (for example size, materials, technical changes, capacity factor)? How will they affect the production of wind electricity?

By the year 2010, probably:

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preferably:

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By the year 2025, probably:

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preferably:

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9. The production costs of wind electricity have decreased by over 80% in 20 years, but for now wind electricity production is still more expensive than conventional production forms.

How probable do you think it is that wind electricity would be economically competitive with other power production forms in Finland in the future, without financial subsidies (e.g., investment subsidies, tax refunds)? And how important would this be for the development of the wind power sector?

Please use scales 1–5 in your answer:

**Probability**

- 1=very improbable
- 2=rather improbable
- 3=probability 50 %
- 4=rather probable
- 5=very probable

**Importance**

- 1=not important at all
- 2=not very important
- 3=rather important
- 4=very important
- 5=extremely important

Probability		Importance	
2010	2025	2010	2025

Please state which assumptions and views your answer is based upon:

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10. Will wind electricity be sold in Finland mainly as so-called green electricity or as bulk electricity (=as 'ordinary' electricity among the rest of electricity)?

Please use scale 1–5 in your answer:

- 1=all as green electricity
- 2=majority as green electricity
- 3=as much as green electricity as bulk electricity
- 4=majority as bulk electricity
- 5=all as bulk electricity

Probable future		Preferable future	
2010	2025	2010	2025

Please state which assumptions and views your answer is based upon:

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11. Will considerations about siting turbines limit the expansion of wind power use in the future?

Please use scale 1–5 in your answer:

- 1=will not limit at all
- 2=will not limit significantly
- 3=will limit clearly
- 4=will limit strongly
- 5=will limit in a determining way

Probable future		Preferable future	
2010	2025	2010	2025

Please state which assumptions and views your answer is based upon:

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12. In Finland, at least investment subsidies, tax refunds, funding of technology programmes, and production of information for those who are interested in wind power have been used to promote wind power so far.

Which of the following instruments will be used in promoting wind power in Finland?

Please use scales 1–5 in your answer:

Probable future

- 1=very improbable
- 2=rather improbable
- 3=probability 50 %
- 4=rather probable
- 5=very probable

Preferable future

- 1=very undesirable
- 2=rather undesirable
- 3=indifferent
- 4=rather desirable
- 5=very desirable

	Probable future		Preferable future	
	2010	2025	2010	2025
Investment subsidy				
Tax subsidy (e.g., refund of the energy tax)				
Research, development and demonstration funding				
Advice about wind power for energy companies				
Information campaigns about wind power for consumers				
A wind electricity quota set for electricity suppliers				
A guaranteed price for wind electricity				
A governmental label system on 'green electricity' (cf. the organic foods label)				
A duty to build wind power by state owned energy companies				
Something else?				

Please state which assumptions and views your answer is based upon:

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13. Please estimate how much the following groups affect the content of Finnish wind power policy.

Please use scales 1–5 in your answer:

- 1=does not affect at all
- 2=does not affect significantly
- 3=affects clearly
- 4=affects strongly
- 5=affects in a determining way

	At present	Probable future		Preferable future	
		2010	2025	2010	2025
European Union					
Parliament					
Government					
Ministry of Trade and Industry					
Ministry of the Environment					
Ministry of Finance					
Municipalities					
Other authorities					
Publicity, media					
Electricity consumers					
Small (local) electricity production companies					
Large electricity production companies					
Research sector					
Nature and environment organisations					
Wind power organisations					
Other energy sector organisations					
Other interest groups of the economic life					
Something else					

Please state which assumptions and views your answer is based upon:

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Thank you for your answers!

## **Appendix 4: List of reviewed Parliament documents**

### **Written questions by MPs and answers to them**

KK 216/1993 vp Kirjallinen kysymys: Kotimaisen energiantuotannon tukemisesta  
KK 123/1994 vp Kirjallinen kysymys: Tuulivoiman tuotannon edistämishjelman toteuttamisesta  
KK 283/1995 vp Kirjallinen kysymys: Tuulivoimaloiden kuluttajaomistuksen mahdollistamisesta  
KK 1358/1998 vp Kirjallinen kysymys: Tuulivoiman edistämisestä  
KK 504/1999 vp Kirjallinen kysymys: Uusien energiantuotantomenetelmien kehittäminen  
KK 597/1999 vp Kirjallinen kysymys: Kotimaisia energialähteitä hyödyntävien investointien tukeminen  
KK 234/2000 vp Kirjallinen kysymys: Tuulivoiman hyödyntäminen  
KK 407/2000 vp Kirjallinen kysymys: Uusiutuvan energian rahaston perustaminen  
KK 734/2000 vp Kirjallinen kysymys: Uusiutuvan energian käytön edistäminen  
KK 829/2000 vp Kirjallinen kysymys: Tuulivoimahankkeille myönnettävien investointitukien alentaminen  
KK 11/2001 vp Kirjallinen kysymys: Tuulivoiman käytön lisääminen  
KK 224/2002 vp Kirjallinen kysymys: Tuulivoimarakentamisen oikeudelliset edellytykset  
KK 229/2003 vp Kirjallinen kysymys: Ilmastomaksun käyttöönotto  
KK 437/2004 vp Kirjallinen kysymys: Ympäristötukien kohdentaminen ja vaikuttavuus  
KK 646/2004 vp Kirjallinen kysymys: Merituulipuiston rakentaminen  
KK 637/2005 vp Kirjallinen kysymys: Tuulivoimaloiden sijoittaminen ja taloudellisuus  
KK 681/2005 vp Kirjallinen kysymys: Suomen tuuliatlaksen päivittäminen  
KK 25/2006 vp Kirjallinen kysymys: Hajautettu energiantuotanto

### **Oral questions by MPs and answers to them**

SKT 104/1996 vp Suullinen kyselytunti: Tuulivoiman energiavero  
SKT 200/2000 vp Suullinen kyselytunti: Tuulivoiman verotus  
SKT 62/2002 vp Suullinen kyselytunti: Kotimaisen biopolttoaineen arvonnalisävero  
SKT 90/2002 vp Suullinen kyselytunti: Uusiutuvien energiamuotojen tuki  
SKT 9/2005 vp Suullinen kyselytunti: Uusien energiamuotojen edistäminen

### **Motions by MPs and documents relating to them**

TAA 315/2000 vp Talousarvioaloite: Määrärahan osoittaminen energiatukeen  
VaVM 43/2000 vp Valtiovarainvaliokunnan mietintö 43/2000 vp  
Hallituksen esitys valtion talousarvioksi vuodelle 2001, Hallituksen esitys vuoden 2001 talousarviota koskevan hallituksen esityksen (HE 109/2000 vp) täydentämisestä  
PKT 164/2000 vp Täysistunnon pöytäkirja  
PKT 168/2000 vp Täysistunnon pöytäkirja  
PKT 170/2000 vp Täysistunnon pöytäkirja  
TPA 284/2001 vp Toimenpideoaloite: Ilmastopennin käyttöönottoaminen  
LTA 30/2002 vp Lisätalousarvioaloite: Määrärahan osoittaminen energiatuen myöntämisvaltuuden korottamiseen  
TAA 10/2003 vp Talousarvioaloite: Määrärahan osoittaminen energiatukeen  
TAA 174/2003 vp Talousarvioaloite: Määrärahan osoittaminen energiatukeen  
TAA 580/2003 vp Talousarvioaloite: Määrärahan osoittaminen myöntämisvaltuuden nostamiseksi uusiutuvan energiantuotannon demonstraatiohankkeita varten  
TAA 789/2003 vp Talousarvioaloite: Määrärahan osoittaminen energiatuen nostamiseen ja ns. demonstraatiotuen palauttamiseen

YmVL 15/2003 vp Ympäristövaliokunnan lausunto 15/2003 vp  
Hallituksen esitys valtion talousarvioksi vuodelle 2004  
VaVM 39/2003 vp Valtiovarainvaliokunnan mietintö 39/2003 vp  
Hallituksen esitys valtion talousarvioksi vuodelle 2004, Hallituksen esitys vuoden 2004 talousarviota koskevan hallituksen esityksen (HE 55/2003 vp) täydentämisestä  
PKT 115/2003 vp Täysistunnon pöytäkirja  
PKT 116/2003 vp Täysistunnon pöytäkirja  
TAA 77/2005 vp Talousarvioaloite: Määrärahan osoittaminen energiatukeen  
TAA 212/2005 vp Talousarvioaloite: Määrärahan osoittaminen kotimaisen uusiutuvan energian käytön lisäämiseen  
TAA 1003/2005 vp Talousarvioaloite: Määrärahan osoittaminen uusiutuvien energianlähteiden demohankkeiden tuen lisäämiseen  
TAA 1098/2005 vp Talousarvioaloite: Määrärahan osoittaminen energiatuen korottamiseen ja ns. demonstraatiotuen palauttamiseen  
TAA 1122/2005 vp Talousarvioaloite: Määrärahan osoittaminen uusiutuvien energialähteiden ja energiansäästön edistämiseen sekä demonstraatiohanketukiin  
YmVL 33/2005 vp Ympäristövaliokunnan lausunto 33/2005 vp; Hallituksen esitys valtion talousarvioksi vuodelle 2006  
VaVM 45/2005 vp Valtiovarainvaliokunnan mietintö: Hallituksen esitys valtion talousarvioksi vuodelle 2006, Hallituksen esitys vuoden 2006 talousarviota koskevan hallituksen esityksen (HE 119/2005 vp) täydentämisestä  
PTK 137/2005 vp Täysistunnon pöytäkirja  
PTK 138/2005 vp Täysistunnon pöytäkirja  
PTK 139/2005 vp Täysistunnon pöytäkirja

#### **Other Government and Parliament documents with references to wind power**

VNS 5/1997 Valtioneuvoston selonteko: Suomen energiasstrategia  
TaVM 22/1997 Talousvaliokunnan mietintö 22: Suomen energiasstrategia, Valtioneuvoston energiapoliittinen selonteko  
YmVL 8/1997 Ympäristövaliokunnan lausunto 8: Suomen energiasstrategia, Valtioneuvoston energiapoliittinen selonteko  
PTK 135/1997 vp Täysistunnon pöytäkirja  
PTK 137/1997 vp Täysistunnon pöytäkirja  
U 34/2000 vp Valtioneuvoston kirjelmä eduskunnalle ehdotuksesta Euroopan parlamentin ja neuvoston direktiiviksi (uusiutuvista energialähteistä tuotetun sähkön käytön edistäminen)  
TaVL 12/2000 vp Talousvaliokunnan lausunto 12/2000 vp  
Valtioneuvoston kirjelmä ehdotuksesta Euroopan parlamentin ja neuvoston direktiiviksi (uusiutuvista energialähteistä tuotetun sähkön käytön edistäminen)  
YmVL 12/2000 vp Ympäristövaliokunnan lausunto 12/2000 vp  
Valtioneuvoston kirjelmä ehdotuksesta Euroopan parlamentin ja neuvoston direktiiviksi (uusiutuvista energialähteistä tuotetun sähkön käytön edistäminen)  
VNS 1/2001 vp Valtioneuvoston selonteko kansallisesta ilmastostrategiasta  
HE 95/2003 Hallituksen esitys eduskunnalle laiksi sähkön alkuperän varmentamisesta ja ilmoittamisesta sekä laiksi sähkömarkkinalain 9 ja 14 §:n muuttamisesta  
TaVM 3/2003 vp Talousvaliokunnan mietintö 3/2003 vp  
Hallituksen esitys laiksi sähkön alkuperän varmentamisesta ja ilmoittamisesta sekä laiksi sähkömarkkinalain 9 ja 14 §:n muuttamisesta  
VNS 5/2005 vp Valtioneuvoston selonteko lähiajan energia- ja ilmastopolitiikan linjauksista - kansallinen strategia Kiiton pöytäkirjan toimeenpanemiseksi (Energia- ja ilmastopoliittinen selonteko)  
HE 100/2006 vp Hallituksen esitys eduskunnalle polttoturpeen ja sillä tuotetun sähkön toimitusvarmuuden turvaamista koskevaksi lainsäädännöksi

TaVM 23/2006 vp Talousvaliokunnan mietintö: Hallituksen esitys polttoturpeen ja sillä  
tuotetun sähkön toimitusvarmuuden turvaamista koskevaksi lainsäädännöksi  
YmVL 35/2006 vp Ympäristövaliokunnan lausunto: Hallituksen esitys polttoturpeen ja  
sillä tuotetun sähkön toimitusvarmuuden turvaamista koskevaksi lainsäädännöksi  
PTK 138/2006 vp Täysistunnon pöytäkirja  
PTK 142/2006 vp Täysistunnon pöytäkirja